SIEMENS

Technical Specification Sheet
Document No.149-478
July 24, 2012

PXC Modular Series

Figure 1. PXC Modular.

Description

The PXC Modular (Programmable Controller - Modular) is an integral part of the APOGEE® Automation System. It is a high performance, modular Direct Digital Control (DDC) supervisory field panel.

The field panel operates stand-alone or networked to perform complex control, monitoring, and energy management functions without relying on a higher level processor.

- Up to 100 modular field panels communicate on a peer-to-peer network.
- With the addition of TX-I/O modules and a TX-I/O Power Supply on a self-forming bus, the PXC Modular can directly control up to 500 points.

With the addition of an Expansion Module, the PXC Modular also provides central monitoring and control for distributed Field Level Network (FLN) devices.

Features

- Modular hardware components match initial control requirements while providing for future expansion.
- DIN rail mounting and removable terminal blocks simplify installation and servicing.
- Proven program sequences to match equipment control applications.
- Sophisticated Adaptive Control, a closed loop control algorithm that auto-adjusts to compensate for load/seasonal changes.
- Built-in energy management applications and DDC programs for complete facility management.
- Comprehensive alarm management, historical data trend collection, operator control and monitoring functions.
- Support for peer-to-peer communications over Industry standard 10/100Base-T TCP/IP networks.
- PXM10T and PXM10S support: Optional LCD Local user interface with HOA (Hand-off-auto) capability and point commanding and monitoring features.

Hardware

PXC Modular

- The PXC Modular is a microprocessor-based multi-tasking platform for program execution and communication with other field panels. It scans field data, optimizes control parameters, and manages operator requests for data in seconds.
- The program and database information stored in the PXC Modular memory is battery-backed. This eliminates the need for time-consuming program and database re-entry in the event of an extended power failure. When battery replacement is necessary, the PXC Modular illuminates a “battery low” status LED and can send an alarm message to selected printers or terminals.
- The PXC Modular firmware, including the operating system, is stored in non-volatile flash memory.
- The PXC Modular provides both an Ethernet port as well as an RS-485 port for communication on Automation Level Networks using either TCP/IP or RS-485.
- An HMI RS-232 port is provided as a connection to a laptop computer for local operation and engineering.
- LEDs provide instant visual indication of overall operation, network communication, and low battery warning.
- Two self-forming buses are an integral part of the flexibility of the PXC Modular. A self-forming bus to the right of the controller supports up to 500 points through TX-I/O™ modules. Another self-forming bus to the left of the controller supports hardware connection to subsystems through Expansion Modules.

TX-I/O Modules

TX-I/O Modules are modular expansion I/O consisting of an electronics module and terminal base. The electronics modules perform A/D or D/A conversion, signal processing, and point monitoring and command output through communication with the PXC Modular. The terminal bases provide for termination of field wiring and connection of a self-forming bus. For more information, see *TX-I/O* (149-476).

The TX-I/O Power Supply provides power for TX-I/O modules and peripheral devices. Multiple Power Modules can be used in parallel to meet the power needs of large concentrations of I/O points (Figure 2 and Figure 3). For more information, see *TX-I/O Power Supplies* (149-476).

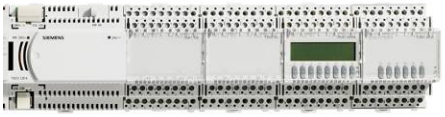

Figure 2. TX-I/O Power Supply and TX-I/O Modules.

Figure 3. PXC Modular, TX-I/O Power Supply, and TX-I/O Modules.

PXC Modular Expansion Module

The PXC Modular Expansion Module (see Figure 4) provides the hardware connection for Field Level Network (FLN) devices. Using the Triple RS-485 Expansion Module, the PXC Modular supports up to three RS-485 networks of Field Level Network devices (see Figure 5).

Figure 4. RS-485 Expansion Module.

Figure 5. RS-485 Expansion Module and PXC Modular.

Modular Control Panels with Application Flexibility

The PXC Modular is a high performance controller with extensive flexibility to customize each field panel with the exact hardware and program for the application. As a result, the user only purchases what is needed.

For example, in monitoring applications, the control panel can be customized with the number and type of points to match the sensor devices. For monitoring and controlling a large number of (on-off) fans or

motors, more digital points can be added (see Figure 6).

Figure 6. PXC Modular, TX-I/O Power Supply, and TX-I/O Modules.

Alternately, if no local point control is required, the PXC Modular can be used to monitor and control Field Level Network devices using the Expansion Modules (see Figure 7).

Figure 7. RS-485 Expansion Module and PXC Modular.

Of course, the PXC Modular can be used for both direct point monitoring and control **and** as a system controller for Field Level Network devices (see Figure 8).

Figure 8. RS-485 Expansion Module, PXC Modular, TX-I/O Power Supply, and TX-I/O Modules.

The control program for each field panel is customized to exactly match the application. Proven Powers Process Control Language (PPCL), a “BASIC” type programming language, provides direct digital control and energy management sequences to precisely control equipment and optimize energy usage.

In a stand-alone configuration, the PXC Modular can fulfill all requirements of a supervisory network coordinator by managing operation schedules and alarms and communicating for the connected devices.

Global Information Access

Each PXC Modular is equipped with an RS-232 port. This port supports the connection of a computer. Devices connected to the terminal port gain global information access.

Multiple Operator Access

Multiple operators can access the network simultaneously. When using the Ethernet ALN option, multiple operators may access the controller through concurrent Telnet sessions and/or local operator terminal ports.

Menu Prompted, English Language Operator Interface

The PXC Modular field panel includes a simple, yet powerful menu driven English Language Operator Interface that provides, among other things:

- Point monitoring and display
- Point commanding
- Historical trend collection and display for multiple points
- Equipment scheduling
- Program editing and modification via Powers Process Control Language (PPCL)
- Alarm reporting and acknowledgment
- Continual display of dynamic information

Built-in Direct Digital Control Routines

The PXC Modular provides stand-alone Direct Digital Control (DDC) to deliver precise HVAC control and comprehensive information about system operation. It receives information from sensors in the building, processes the information, and directly controls the equipment. The following functions are available in the PXC Modular:

- Adaptive Control, an auto-adjusting closed loop control algorithm. Provides more efficient, adaptive, robust, fast, and stable control than the traditional PID control algorithm. Superior in terms of response time, holding steady state, and minimizing error, oscillations, and actuator repositioning.
- Closed Loop Proportional, Integral and Derivative (PID) control.
- Logical sequencing.
- Alarm detection and reporting.
- Reset schedules.

Built-in Energy Management Applications

The following applications are programmed in the PXC Modular and require simple parameter input for implementation:

- Peak demand limiting
- Start-Stop time optimization
- Equipment scheduling, optimization and sequencing
- Duty cycling
- Economizer control

Licensable Options

The following features are available on the PXC Modular P2 controllers and require a license for implementation:

- Field Panel GO
- Virtual AEM

Specifications

Dimensions

PXC Modular Series	7.56 in. L × 3.54 in. W × 2.76 in. D (192 mm L × 90 mm W × 70 mm D)
Expansion Module with three P1 RS-485 FLN connections	1.26 in. L × 3.54 in. W × 2.76 in. D (32 mm L × 90 mm W × 70 mm D)

Electrical, Processor, Battery, and Memory

Power Consumption	24 VA @ 24 Vac
Processor	MPC885 (PowerPC®)
Processor Clock Speed	133 MHz
Memory	72 MB (64 MB SDRAM, 8 MB Flash ROM)
Secure Digital Input/Output (SDIO) card	Expandable or removable non-volatile memory
Battery backup of SDRAM	30 days (accumulated) AA (LR6) 1.5 Volt Alkaline (non-rechargeable)
Battery backup of Real Time Clock	12 months (accumulated) Cell coin 3 Volt lithium

Communication

Ethernet Automation Level Network (EALN) port BACnet I/P Ethernet Automation Level Network port	10Base-T or 100Base-TX compliant
RS-485 Automation Level Network (ALN) port	1200 bps to 115.2 Kbps
Expansion Bus for support of sub-system networks	1200 bps to 115.2 Kbps
TX-I/O Self forming bus connection	115.2 Kbps
Human-Machine Interface (HMI) port	RS-232 compliant
USB Device Port	Standard 1.1 and 2.0 USB device port, full speed 12 Mbps, low speed 1.5 Mbps, Type B connector
USB Host port	Standard 1.1 and 2.0 USB host port, full speed 12 Mbps, low speed 1.5 Mbps, Type A connector

Electrical Rating

AC Power	NEC Class 2
Communication	NEC Class 2

Operating Environment

Ambient operating temperature	32°F to 122°F (0°C to 50°C), <95% rh, non-condensing
Ambient operating environment	Operate in a dry location, which is protected from exposure to salt spray or other corrosive elements. Exposure to flammable or explosive vapors must be prevented.
Shipping and Storage environment	-40°F to +185°F (-40°C to +85°C) <95% rh, non-condensing
Shipping environment	-13°F to 158°F (-25°C to 70°C), 5% to 95% rh, non-condensing
Mounting Surface	Building wall or structural member

Agency Listings

UL	UL 864 UUKL Smoke Control Equipment UL 864 UUKL7 Smoke Control Equipment CAN/ULC-S527-M8 UL 916 PAZX UL 916 PAZX7
Agency Compliance	FCC Compliance Australian EMC Framework European EMC Directive (CE) – with enclosure
OSHPD Seismic Certification	Product meets OSHPD Special Seismic Preapproval certification (OSH-0217-10) under California Building Code 2010 (CBC2010) and International Building Code 2009 (IBC2009) when installed within the following Siemens enclosure part numbers: PXA-ENC18, PXA-ENC19, or PXA-ENC34.

Product Ordering Information

Description	Product Number
PXC MOD, P2, 96 NODE, APOGEE	PXC00-PE96.A
PXC MOD, P2, TX-I/O, 96 NODE, APOGEE	PXC100-PE96.A
PXC MOD, BACnet, 96 NODE, APOGEE	PXC00-E96.A
PXC MOD, BACnet, TX-I/O, 96 NODE, APOGEE	PXC100-E96.A
Add support for TX-I/O	PXF-TXIO.A
Virtual AEM License	LSM-VAEM
Field Panel GO License	LSM-FPGO
Expansion Module, three RS-485 connections	PXX-485.3

Accessories

Product Number	Description
PXM10S	Controller mounted Operator Display module with point monitor and optional blue backlight
PXM10T	Controller mounted Operator Display module
PXA-HMI.CABLEP5	Serial cable required for PXM10T/S connection to PXC Series controllers

Document Ordering Information

Description	Document Number
PXC Modular Series Owner's Manual	125-3582
Powers Process Control Language (PPCL) User's Manual	125-1896

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Siemens Industry, Inc.
Building Technologies Division
1000 Deerfield Parkway
Buffalo Grove, IL 60089-4513
USA
(847) 215-1000

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Technical Specification Sheet
Document No. 149-171P25
August, 2012

Terminal Box Controller

Figure 1. Terminal Box Controller.

The Terminal Box Controller (Figure 1) provides high performance Direct Digital Control (DDC) of pressure-independent, variable-air-volume zone-level routines. The Terminal Box Controller can operate stand-alone or can be networked to perform complex HVAC control, monitoring and energy management functions. This controller is designed to reside on the Siemens control system.

Features

- PID control of HVAC systems to minimize offset and maintain tighter setpoint control
- Unique control algorithms for specific applications
- Reports airflow in cfm (l/s)
- Plenum rated controller
- Setpoints and control parameters assigned and changed locally or remotely
- Setpoints and control parameters stored in Electrically Erasable Programmable Read Only Memory (EEPROM)—no battery backup required
- Returns from power failure without operator intervention
- Meets low duct static pressure requirements
- No calibration required, thereby reducing maintenance costs
- Separate minimum and maximum air volume setting for heating and cooling modes
- Secure Mode (P/Ns 540-100C and 540-200C) prevents unauthorized users from making changes to the controller through the HMI port or room sensor (supports FDA 21 CFR Part 11 compliance – guidelines for protection of electronic records)
- Applications in P/Ns 540-100C and 540-200C include a user-adjustable offset for the room temperature reading when required for validation purposes
- UL and cUL Listed for Smoke Control

Applications

- VAV Cooling Only
- VAV Cooling or Heating
- VAV with Hot Water Reheat (proportional)
- VAV with Electric Reheat (one-, two-, or three-stage)
- VAV Fan Powered Series or Parallel with Hot Water Reheat
- VAV Fan Powered Series or Parallel with Electric Reheat (one-, two-, or three-stage)

Control algorithms are preprogrammed. The controller is ready to operate after selecting the application and assigning the unit's controller address. If desired, the operator may adjust the air volume setpoints in cfm (lps), room temperature setpoints and other parameters. The controller is designed for operation and modification without vendor assistance.

Secure Mode Features

Secure Mode

The Terminal Box Controller is also offered with an optional feature, Secure Mode (P/Ns 540-100C and 540-200C). Secure Mode prevents unauthorized users from making any changes to the controller through the HMI port or room sensor. This functionality allows the controller to support FDA 21 CFR Part 11 compliance - guidelines for protection of electronic records.

Hardware

Controller Board

The Terminal Box Controller consists of an electronic controller assembly and a differential pressure transducer. This controller provides all wiring terminations for system and local communication and power. The cable from the room sensor (purchased separately) connects to an RJ-11 jack on the controller. All other connections are removable terminal blocks. The controller assembly is mounted on a plastic track that mounts directly on the terminal box. An optional enclosure (P/N 550-002) protects the controller assembly.

An Autozero Module is available for mounting on the controller for those applications where uninterrupted airflow is necessary. A Pneumatic Transducer provides control of pneumatic damper and valve actuators.

The controller interfaces with the following external devices:

- Averaging air velocity sensors provided by VAV terminal unit manufacturers
- Floating control valve and damper actuators
- Temperature sensors (room, duct, immersion, and outside air)
- Service and commissioning tools
- Digital input devices (dry contacts from motion sensors, alarm contacts)
- Digital output devices (fan, stages of electric heat)

Room Sensor

The room sensor connection to the controller board consists of a quick-connect RJ-11 jack. This streamlines the installation and reduces controller start-up time.

Terminal Box Controller Specifications

Power Requirements	
Operating Range	19.2 to 27.6 Vac 50 or 60 Hz
Power Consumption	60 VA maximum @ 24 Vac
Inputs	
Analog	1 room temperature sensor 1 velocity sensor 1 set point (optional) 1 auxiliary temperature sensor
Digital	2 dry contacts
Outputs	6 DO 24 Vac optically isolated solid state switches @ 0.5 Amp (0.25 Amp for Smoke Control)
Controlled Temperature Accuracy, Heating or Cooling	±1.5°F (0.9°C)
Dimensions	4-1/8" W x 7-3/4" L x 1-1/2" H (105 mm x 197 mm x 38 mm)
Weight	approx. 3 lbs. (1.35 kg)
Communications	
Remote	FLN Trunk
Local	WCIS
Ambient Conditions	
Shipping & Storage Temperature	-13°F to 158°F, (-25°C to 70°C)
Operating Temperature	32°F to 122°F (0°C to 50°C)
Humidity Range	5 to 95% rh (non-condensing)
Agency Listings	CE, C-tick
UL Listing	UL 916, PAZX UL 864, UUKL
cUL Listed	
CSA Certified	
FCC Compliance	

Autozero Module

The optional Autozero Module (Figure 2) is required when continuous operation at occupied flow is required for an area. The Autozero Module is connected to the air velocity inlet ports of the Controller and provides periodic recalibration of the air velocity transducer without changing air volume being delivered to a room. This recalibration ensures long-term precise airflow delivery.

Autozero Module Specifications

Power Consumption	.75 VA @ 24 Vac max.
Dimensions	2" W x 1.51" H x 1.89"D (58 mm x 78 mm x 29mm)
Weight	1.3 oz. (36.9 g)

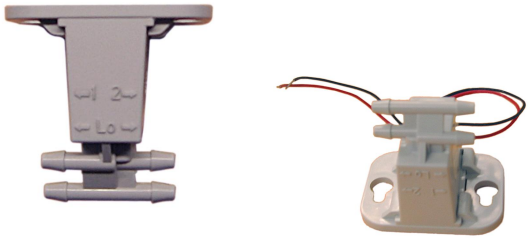

Figure 2. Autozero Module.

Differential Pressure Sensor

The differential pressure sensor is easily connected to the box's air-velocity sensing elements to provide measurement of the differential pressure. The measured value is converted to actual airflow in cfm (l/s) by the controller.

Differential Pressure Sensor Specifications

Temperature Range	32°F to 122°F (0°C to 50°C)
Measurement Range	0 to 4000 fpm (0 to 20 m/s)

Pneumatic Transducer

The PTS Pneumatic Transducer contains the transducers that provide the signal conversion from electronic to pneumatic. The module is piped to the pneumatic actuator and wired to the Terminal Box Controller. This transducer provides for accurate control of pneumatic actuators for precise temperature and air volume control.

Pneumatic Transducer Specifications

Maximum Input Pressure	30 psi (207 kPa)
Air Consumption	0 SCIM
Power Consumption	4 VA @ 24 Vac max.
Dimensions	3-1/2" L x 2-1/4" W x 1-1/2" H (87 mm x 57 mm x 38 mm)
Weight	9 oz (0.3 kg)

Product Ordering Information

Description	Product Part Numbers
Terminal Box Controller	540-100
Terminal Box Controller with Secure Mode	540-100C
Terminal Box Controller with Autozero Module	540-200
Terminal Box Controller with Autozero Module with Secure Mode	540-200C
Smoke Control Listed Terminal Box Controller	540-100K
Smoke Control Listed Terminal Box Controller with Secure Mode	540-100CK
Smoke Control Listed Terminal Box Controller with Autozero Module	540-200K
Smoke Control Listed Terminal Box Controller with Autozero Module with Secure Mode	540-200CK
Smoke Control Listed Large Equipment Controller Enclosure	550-002K
Smoke Control Listed Small Equipment Controller Enclosure	540-155K
UL Listed Class 2 transformer with 120/240/277/480 Vac 50/60 HZ 0.4A primary w/ hub and 24Vac 50VA secondary w/ hub and circuit breaker for use with Smoke Control Listed Equipment Controllers	5041MWCB (SBT P/N MUC0240502 TFCB)
UL Listed Class 2 transformer with 120/240/277/480 Vac 50/60 HZ 0.5A primary w/ hub and 24Vac 96VA secondary w/ hub and circuit breaker for use with Smoke Control Listed Equipment Controllers	10041MWCB (SBT P/N MUC0241002 TFCB)
Pneumatic Transducer	PTS4

Document Information

Specification Sheet/Application Bulletin	Document Part Number
Room Temperature Sensors – Series 1000	149-312P25
Duct Temperature Sensor	149-134P25
Electronic Damper Actuator	155-188P25 (GDE 131.1P)
Siemens Valves and Electronic Actuators:	
Flowrite 599 Series – Valve and Actuator Assembly Selection	155-304P25
Powermite 599 Series – MT Series Terminal Unit Valve and Actuator Assembly Selection	155-306P25
Powermite 599 Series – MZ Series Zone Control Valve and Actuator Assembly Selection	155-307P25

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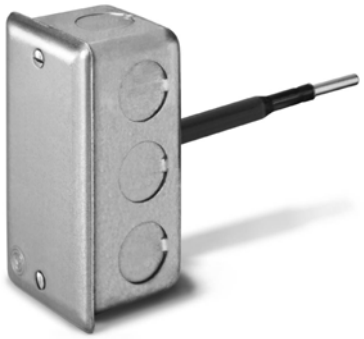
Technical Specification Sheet
Document Number 149-134P25
July 21, 2009

Duct Point Temperature Sensors



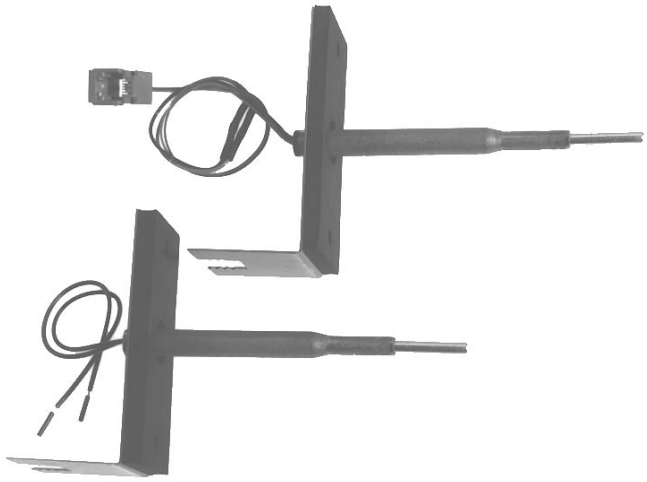
Applications

Zone controllers use the Duct Point Temperature Sensors when an accurate, reliable indication of duct temperature is needed. They are well-suited for applications such as heating and cooling, morning warm up/cool-down, and monitoring discharge air temperature. The sensors' resistance varies proportionally to the actual duct air temperature being measured.

Description

The Duct Point Temperature Sensors provide an input for temperature monitoring and control. The 10K ohm thermistor sensors are available with either a flexible mounting plate or an attached 2 × 4 metal enclosure. The 100K ohm thermistor sensors are only available with a flexible mounting plate. The sensors are designed for quick and easy mounting on either round or rectangular sheet metal ductwork. A gasket and self-drilling screws are included with the sensors. The sensors are wired to the controller via a cable, which transmits the temperature signal to the controller.

NOTE: The 10K ohm thermistor sensors with RJ-11 male connections only work when substituted for the room temperature sensor that is normally connected to the Siemens APOGEE P1 TEC or BACnet TEC controller at the RJ-11 communication port.



Specifications

Temperature Monitoring Range	
10,000 ohms (RJ-11 types only)	55°F to 95°F (13°C to 35°C)
10,000 ohms (Free-wire types)	-40°F to 240°F (-40°C to 116°C)
100,000 ohms	-35°F to 240°F (-37°C to 116°C)
Sensor elements	Thermistor
Output signal	Changing resistance
Installation adjustment	None required
Calibration adjustment	None required
Factory calibration point	77°F (25°C)
Mid-Range Accuracy	
10,000 ohms	± .5°F (± .3°C)
100,000 ohms	± 1.1°F (± .6°C)
Thermistor resistance @ calibration point	10,000 ohms or 100,000 ohms
Installation (maximum cable length shared in conduit with other NEC Class 2 wiring)	100 feet (30.48 m)
Dimensions	
Probe length	3 inches (76.2 mm) or 18 inches (457 mm)
Mounting plate	1-1/2” W × 3-1/2” H (37.6 mm × 89 mm)

Ordering Information

Duct Temperature Sensor	
10,000 ohms (Wire into TEC RJ-11 port [replaces room sensor])	
Mounting flange with 4” probe	540-128
2 × 4 box with 4” probe	538-871
2 × 4 box with 18” probe	540-739
10,000 ohms (Wire into BACnet TEC AI3 Aux port)	
2 × 4 box with 4” probe	QAM2030.010
2 × 4 box with 8” probe	QAM2030.020
2 × 4 box with 18” probe	QAM2030.045
100,000 ohms (Wire into P1 TEC AI3 Auxilliary port)	
Mounting flange	536-811
Accessory	
TEC Duct Point Sensor Setpoint Adapter	540-656

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Siemens Building Technologies, Inc.
Industry Sector
1000 Deerfield Parkway
Buffalo Grove, IL 60089-4513
(847) 215-1000

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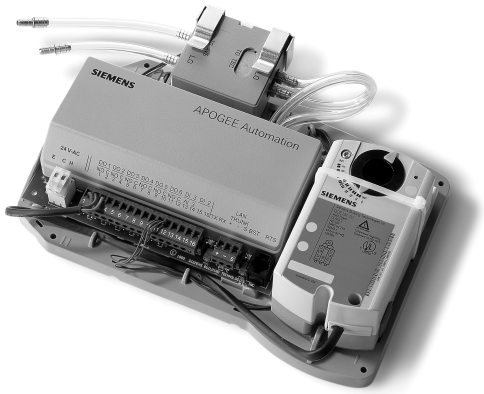
Technical Specification Sheet
Rev. 1, June, 2001

TEC /Actuator Package



TEC/Actuator Package

Description

This new offering pairs a terminal equipment controller (TEC) with a GDE131.1U Actuator on a common plate. The TEC/Actuator Package reduces installation time, and therefore cost, by providing the Field Installer a pre-assembled package that mounts in less time than what is required to separately mount the components. It is a low cost solution for field applications requiring VAV or CV applications with an electronic actuator.

TEC Specifications

Dimensions – 6 DO board assembly (in.)	4-1/8 x 7-11/16 x 1-27/32 (105mm x 195mm x 47mm)
Dimensions – Auto zero module w/bracket (in.)	2-15/32 x 3-¾ x 1-1/16 (63mm x 95mm x 27mm)
Dimensions – Plate (in.)	Without AZM: Approx. 10 x 6.5 With AZM: Approx. 10 x 7.5
Power Source	24 Vac 50/60 Hz +15%, -15% (limited by actuator)
Power Consumption @ 24 Vac (plus loads)	Nominal 3.5 V Peak 5 VA
Operating Temperature Range	32° to 122°F (0° to 50°C)
Storage Temperature Range	-22° to 140°F (-30° to 60°C) (limited by actuator)
Humidity Range	10% to 95% non-condensing
Agency Listings	UL 916, PAXZ; UDTZ; FCC Part 15, Class A CSA-Std. C22.2 No 205

Actuator Specifications

Power Supply	
Operating Voltage	24 Vac +15%, -15%
Frequency	50/60 Hz
Power Consumption	2.3 VA
Equipment Rating	UL—Class 2, CSA Class III per EN60730
Function	
Torque	44 lb-in (5 Nm)
Runtime for 90° opening or closing	90 sec. At 60 Hz (108 sec. At 50 Hz)
Nominal angle of rotation	90°
Maximum angular rotation	95°

Mounting	
Shaft size	3/8 to 5/8 inch (8 to 16mm) diameter
Minimum shaft length	1-1/2 inch (38 mm)
Housing	
Material	Durable plastic
Gear lubrication	Silicone free
Ambient Conditions	
Ambient temperature – operation	32 to 122°F (0 to 50°C) (limited by TEC)
Storage and transport	-22 to 140°F (-30 to 60°C)
Ambient humidity (non-condensing)	95% R.H.
Agency Certification	UL listed to UL873; C-UL certified to Canadian Standard; C22.2 No. 24-93
Miscellaneous	
Pre-cabled connection	18 AWG
Life cycle	Designed for over 50,000 full stroke cycles at rated torque and temperature

Ordering Information

	New Combo	**Includes these existing components**		
Application Type	**New Part Number**	**Existing TEC Part Number**	**Gap Actuator Number**	**AZM Part Number**
Variable Air Volume	550-065	540-100	GDE 131.1U	– –
	550-066	540-200	GDE 131.1U	540-378
Constant Volume	550-067	540-103	GDE 131.1U	– –
	550-068	540-104	GDE 131.1U	540-378

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Siemens Building Technologies, Inc.
1000 Deerfield Parkway
Deerfield, IL 60089-4513

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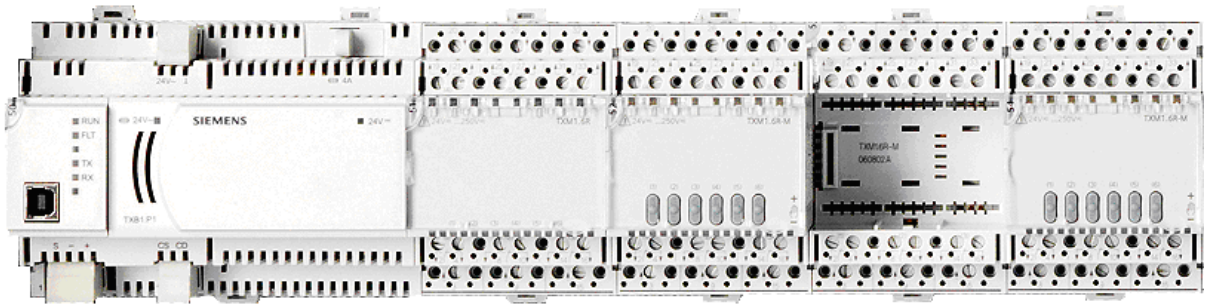
Technical Specification Sheet
Document No. 149-476
June 11, 2010

TX-I/O Product Range



Description

TX-I/O™ is a range of I/O modules, with associated power and communication modules, for use within the APOGEE system. The TX-I/O product range includes the following:

- Eight types of I/O modules, which act as signal converters. The I/O modules communicate between the PXC Modular or the PXC-36 and the related devices in the building services plant.
- TX-I/O Power Supply for the TX-I/O modules.
- TX-I/O Bus Connection Module, which bridges communication and power from one DIN rail to another.
- TX-I/O Island Bus Expansion (IBE) module, which bridges communication between the primary field panel and expansion field panels.
- P1 Bus Interface Module (BIM), which connects TX-I/O modules to the P1 FLN. The P1 BIM provides power for TX-I/O modules, but it does not contain applications or perform control; the control database for the TX-I/O points resides in a field panel.

TX-I/O Modules provide I/O points for APOGEE based upon TX-I/O Technology. TX-I/O Technology provides flexibility of point types, tremendous flexibility of signal types and support for manual operation.

There are eight types of TX-I/O modules:

- 8 point DI module (TXM1.8D)
- 16 point DI module (TXM1.16D)
- 6 point DO with Relay module (TXM1.6R)
- 6 point DO with Relay and Manual Override module (TXM1.6R-M)
- 8 point Universal module (TXM1.8U)
- 8 point Universal with local override/identification device (LOID) module (TXM1.8U-ML)
- 8 point Super Universal module (TXM1.8X)
- 8 point Super Universal with LOID module (TXM1.8X-ML)

Features

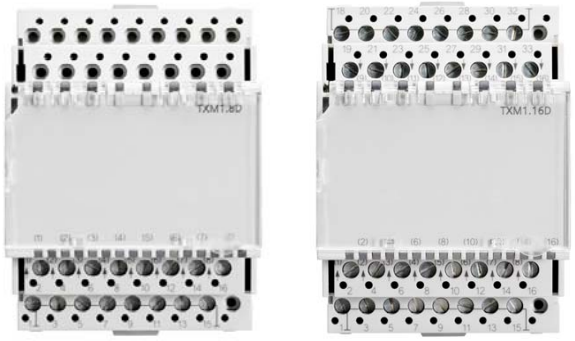
- The *self-forming TX-I/O island bus* transmits power as well as communication signals.
  - The TX-I/O island bus can be extended a maximum of 164 feet (50 meters).
  - Adding an Island Bus Expansion (IBE) module expands communication data up to an additional maximum of 200 feet (61 m) in two directions.
- *Hot-swappable electronic components* allow powered electronics to be disconnected and replaced without removing terminal wiring or disturbing the self-forming bus.

All TX-I/O modules include the following features:

- DIN rail mounting.
- High density (point count to physical dimensions).
- Hardware addressed with address keys.
- Removable label holder that allows for customized point labels.
- LEDs that provide status indication and diagnostic information for the I/O module, as well as for each point on the module.
- Separable into terminal base and plug-in I/O module electronics for:
  - Improved installation workflow, allowing field wiring to be terminated prior to installation of electronics.
  - Optimum diagnostics—connected peripheral devices can be measured without affecting or being affected by the I/O module.
  - Quick replacement of electronics for service.

Module Introduction

Digital Input Modules (TXM1.8D and TXM1.16D)



The TXM1.8D and TXM1.16D are dedicated to monitoring, respectively, 8 and 16 digital input points.

- They monitor status signals from normally open (NO) or normally closed (NC), latched voltage free/dry contacts.
- All 8 points on the TXM1.8D module, as well as 8 of the 16 points on the TXM1.16D module, may be used as pulse counters up to 10 Hz.
- Each input point has a green LED for status indication.

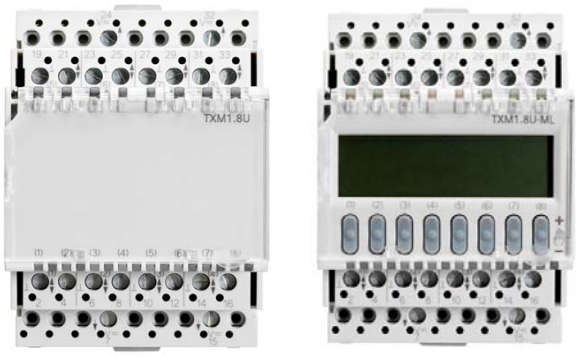
NOTE: No potential (dry contact) for all points.

Digital Output Modules (TXM1.6R and TXM1.6R-M)

The TXM1.6R and TXM1.6R-M Digital Output Modules provide six NO or NC (form C), maintained or pulsed, voltage free/dry contacts.

- The contacts are rated for a maximum of 250 Vac at 4A.
- Each I/O point has a green LED for status indication.
- The TXM1.6R-M module is also equipped with manual override switches. An orange LED per override switch indicates override status individually per point.

Universal Modules (TXM1.8U and TXM1.8U-ML)



The TXM1.8U and TXM1.8U-ML Universal I/O modules provide 8 points, which can be individually software configured as digital input, analog input, or analog output to best meet the specific application needs.

All Universal I/O modules provide:

- Class 2 AC distribution voltage for peripheral devices, such as valves and actuators.
- Green LED status per I/O point that varies in intensity according to the voltage and current (directly proportional).

Digital input support includes:

- Voltage free/dry contacts
- Pulse counters up to 25 Hz

Analog input sensor support includes:

- 1K Nickel – Landis & Gyr curve
- 1K Platinum – 375 and 385 coefficient
- 10K and 100K Thermistor – Type II Curve

Active input and output support includes:

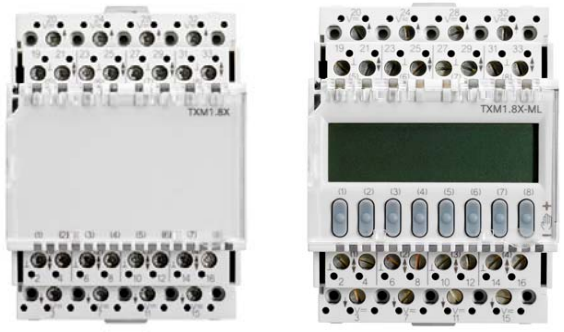
- Analog input voltage 0-10 Vdc
- Analog output voltage 0-10 Vdc

TXM1.8U-ML modules are also equipped with a local override/identification device (LOID), which includes an LCD signal display. The LCD displays the following information for each I/O point:

- Configured signal type
- Symbolic display of process value
- Notification of faulty operation, short circuit, or sensor open circuit

Orange LEDs indicate override status individually per point.

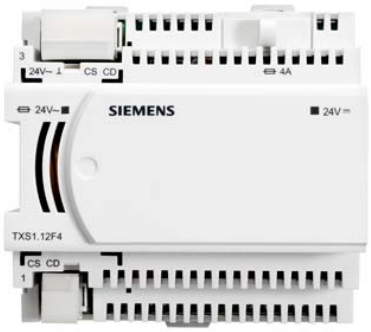
Super Universal Modules (TXM1.8X and TXM1.8X-ML)



The TXM1.8X and TXM1.8X-ML Super Universal modules share all of the Universal module features, and also provide:

- Analog input current 4-20 mA
- Analog output current 4-20 mA (four current outputs maximum per module on Points 5 through 8)
- 24 Vdc distribution from power supply for sensors at a maximum of 200 mA per module

TX-I/O Power Supply (TXS1.12F4)



The TX-I/O Power Supply generates 24 Vdc at 1.2A to power TX-I/O modules and peripheral devices.

- Up to 4 TX-I/O Power Supplies can be operated in parallel, with a maximum of two per DIN rail.
- It can be located within a row of TX-I/O modules or at the beginning of a new DIN rail.

The TX-I/O Power Supply performs the following functions:

- Transfers 24 Vac at 4A to power TX-I/O modules and peripheral devices.
- Routes CS (+24 Vdc Communication Supply) and CD (Communication Data signal) between DIN rails.
- Provides an input point for 24 Vac to power additional peripheral devices.
- Isolates the 24 Vac peripheral device supply in case of overload or short-circuit with Class 2 distribution. The replaceable AC fuse can be accessed from an installed module.
- Indicates the AC fuse status (via LED) for easy diagnostics.

TX-I/O Bus Connection Module (TXS1.EF4)

The Bus Connection Module transfers DC power for TX-I/O modules and peripheral devices and transfers AC power for peripheral devices.

- It can be located within a row of TX-I/O modules or at the beginning of a new DIN rail.

The TX-I/O Bus Connection Module performs the following functions:

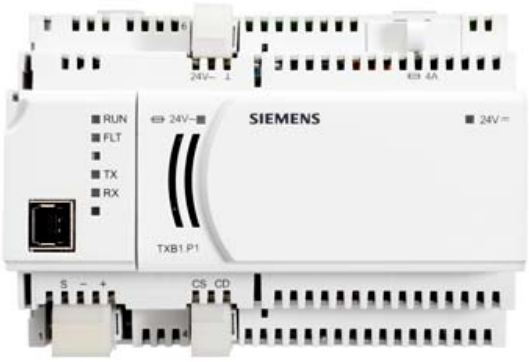
- Routes CS (+24 Vdc Communication Supply) and CD (Communication Data Signal) between DIN rails.
- Provides an input point for 24 Vac to power additional peripheral devices.
- Isolates the 24 Vac peripheral device supply in case of overload or short-circuit with Class 2 distribution. The replaceable AC fuse can be accessed from an installed module.
- Indicates the AC fuse status (via LED) for easy diagnostics.

TX-I/O Island Bus Expansion Module (TXA1.IBE)

The TX-I/O Island Bus Expansion (IBE) module increases the distance between the primary field panel and expansion field panels without affecting the TX-I/O island bus maximum distance.

- An LED provides an indication of island bus communication.
- The IBE converts the TX-I/O island bus signal on the self-forming rail to an RS-485 signal level on the connector.
  - Each IBE module supports a maximum of two RS-485 segments.
  - Each segment may extend up to 200 ft (61 m) from the primary enclosure.
  - The island bus length extended from the primary field panel is added to island bus length extended from any expansion panel. RS-485 segment length between the IBEs does not add to the island bus length.
- The IBE does not transfer power over the RS-485 segment.
- Switches set the IBE as the TX-I/O island bus master (BM) or an RS-485 end-of-line terminator.
- A programming tool is not required.
- A maximum of 5 IBEs may be installed on the island bus: one IBE in the primary enclosure plus one in each expansion enclosure (maximum of 4).
- Only one Island Bus Expansion (IBE) module per enclosure is permitted.
- Expansion enclosures must be supplied using a separate TX-I/O Power Supply. Loss of this power does not affect the primary enclosure.

P1 Bus Interface Module (TXB1.P1)



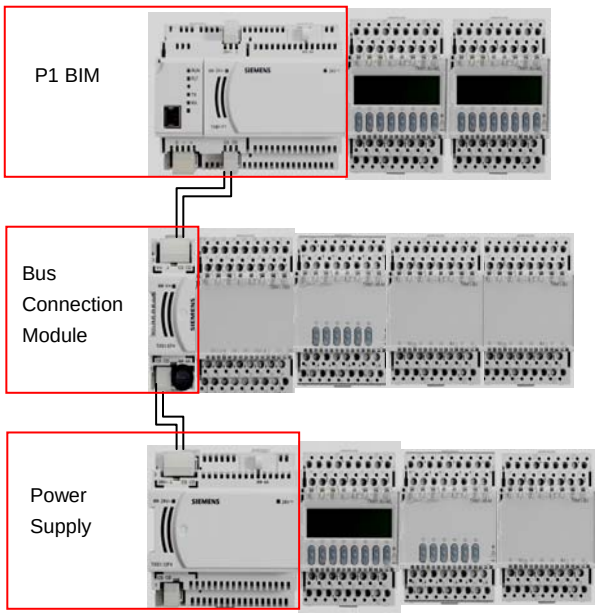
The P1 Bus Interface Module (P1 BIM) provides P1 FLN communication and power for TX-I/O modules. It does not contain application or control for the TX-I/O modules.

The P1 BIM provides the following features:

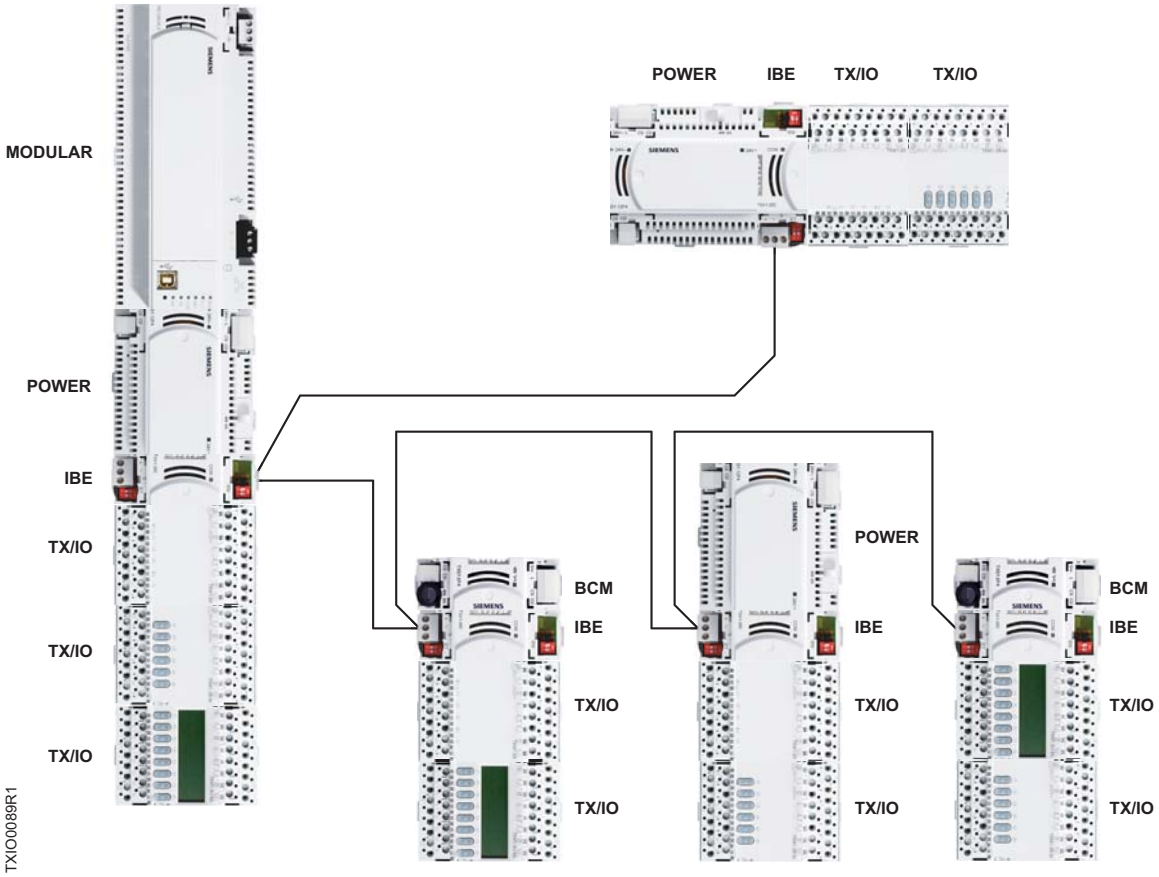
- Communication on the P1 FLN or MEC Expansion Bus.
- Support for 80 TX-I/O points.
- Support for 10 I/O modules.
- 24 Vac input.
- Generation of 24 Vdc at 600 mA to power TX-I/O modules and peripheral devices.
- Transfer of 24 Vac at a maximum of 4A to power peripheral devices.
- Plug-in screw terminals.
- Isolates the peripheral device supply in case of overload or short-circuit with Class 2 distribution. The replaceable AC fuse can be accessed from an installed module.
- Separate LEDs for module operation, FLN communication activity, 24 Vdc present on the TX-I/O island bus, and monitoring of the 24 Vac fuse.

TX-I/O island bus Extension

The following picture shows the TX-I/O island bus extended using a Bus Connection Module and TX-I/O Power Supply. This configuration allows the TX-I/O island bus to extend a maximum of 164 feet (50 meters), and may extend outside an enclosure.



The following picture shows the TX-I/O island bus expanded using five Island Bus Expansion modules.



I/O Functions by Module

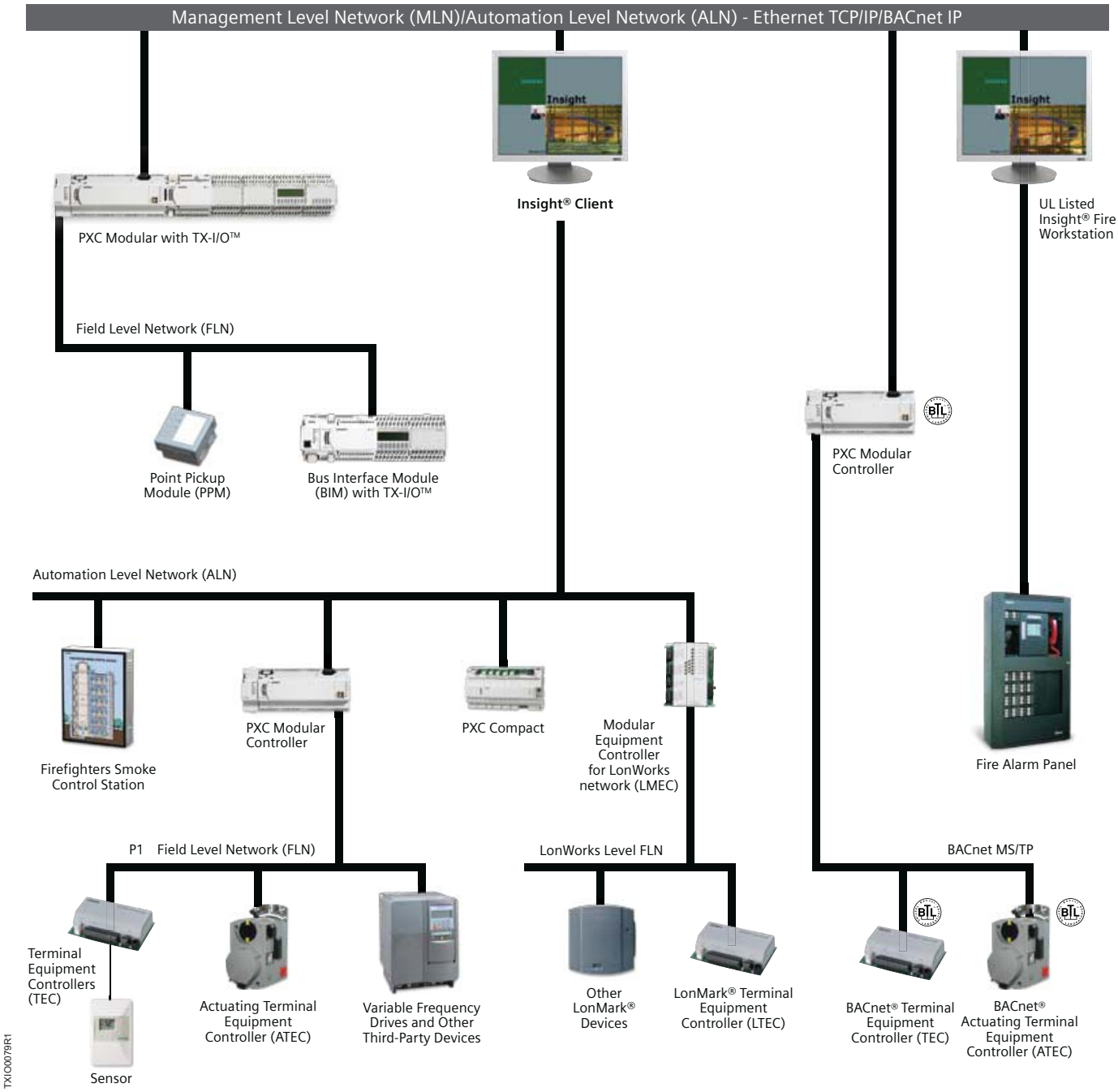
TX-I/O™ function	Description	Module type: TXM1.8D	TXM1.16D	TXM1.8U	TXM1.8U-ML	TXM1.8X	TXM1.8X-ML	TXM1.6R	TXM1.6R-M
		Maximum number of functions per module							
Digital inputs									
Binary Input	Status indication, voltage-free/dry contact	8	16	8	8	8	8		
Counter	Count/accumulator, voltage-free/dry pulse contact	8	8	8	8	8	8		
Analog Inputs									
	Temperature LG-Ni1000			8	8	8	8		
	Temperature Pt 1000 375			8	8	8	8		
	Temperature Pt 1000 385			8	8	8	8		
	Temperature (NTC) 10 K			8	8	8	8		
	Temperature (NTC) 100 K			8	8	8	8		
	Voltage, DC 0 … 10V *			8	8	8	8		
	Current DC 4… 20 mA *					8	8		
Digital outputs									
BO OnOff	Latched contact, AC/DC 250V, 4A							6	6
BO Pulse	Pulse							6	6
Analog Outputs									
	DC 0..10 V *			8	8	8	8		
	DC 4 ... 20 mA *					4	4		

* Active inputs and active outputs (0-10V and 4-20 mA) must be located on different modules if sensors are externally powered.

TX-I/O Network Architecture Example

The following architecture picture shows TX-I/O modules connected to:

- A P1 BIM located on the Field Level Network.
- A PXC Modular on Ethernet TCP/IP.


Management Level Network (MLN)/Automation Level Network (ALN) - Ethernet TCP/IP/BACnet IP
Insight
Insight
PXC Modular with TX-I/O™
Insight® Client
UL Listed Insight® Fire Workstation
Field Level Network (FLN)
PXC Modular Controller
Point Pickup Module (PPM)
Bus Interface Module (BIM) with TX-I/O™
Automation Level Network (ALN)
Firefighters Smoke Control Station
PXC Modular Controller
PXC Compact
Modular Equipment Controller for LonWorks network (LMEC)
Fire Alarm Panel
P1 Field Level Network (FLN)
LonWorks Level FLN
BACnet MS/TP
Terminal Equipment Controllers (TEC)
Sensor
Actuating Terminal Equipment Controller (ATEC)
Variable Frequency Drives and Other Third-Party Devices
Other LonMark® Devices
LonMark® Terminal Equipment Controller (LTEC)
BACnet® Terminal Equipment Controller (TEC)
BACnet® Actuating Terminal Equipment Controller (ATEC)
TXIO0079R1

Specifications:

Dimensions (L × W × D)	
TX-I/O Modules	2.52” × 3.54” × 2.75” (64 mm × 90 mm × 70 mm)
TX-I/O P1 BIM	5” × 3.54” × 2.75” (128 mm × 90 mm × 70 mm)
TX-I/O Power Supply	3.78” × 3.54” × 2.75” (96 mm × 90 mm × 70 mm)
TX-I/O Bus Connection Module	1.26” × 3.54” × 2.75” (32 mm × 90 mm × 70 mm)
TX-I/O Island Bus Expansion (IBE) Module	1.26” × 3.54” × 2.75” (32 mm × 90 mm × 70 mm)
Electrical	
Power Requirements	24 Vac +/-20% input @ 50 or 60 Hz
Power Consumption	
Power Supply	35 VA with 96 VA pass-thru
Bus Connection Module	0 VA with 96 VA pass-thru
TX-I/O P1 BIM	20 VA with 96 VA pass-thru
With the above power consumption, the Power Supply produces 28.8 W (1.2A at 24 Vdc) and the P1 BIM provides 14.4 W (0.6A at 24 Vdc) to be used by the following:	
TXM1.8D	1.1 W
TXM1.16D	1.4 W
TXM1.8U	1.5 W
TXM1.8U-ML	1.8 W
TXM1.8X	2.2 W
TXM1.8X-ML	2.3 W
TXM1.6R	1.7 W
TXM1.6R-M	1.9 W
Island Bus Expansion Module	1.2 W
Terminations	
I/O Terminals	20-12 AWG Solid 20-14 AWG Stranded
Power Supply, BCM, P1 BIM, and IBE	2-, 3-, or 4-position screw terminal pluggable blocks
Operating Environment	32°F to +122°F (0°C to 50°C), 5 to 93% rh, non-condensing
Agency Listings	UL 864 UUKL Smoke Control Equipment UL 864 UUKL7 Smoke Control Equipment UL 916 PAZX CSA 22.2 No. 205 PAZX7
Agency Compliance	FCC Compliance Australian EMC Framework (C-Tick) European EMC Directive (CE) European Low Voltage Directive (LVD)

Ordering Information

TX-I/O I/O Modules

Product Number	Description
TXM1.8D	TX-I/O Module, 8 DI points
TXM1.16D	TX-I/O Module, 16 DI points
TXM1.8U	TX-I/O Module, 8 Universal points
TXM1.8U-ML	TX-I/O Module, 8 Universal points with LOID
TXM1.8X	TX-I/O Module, 8 Super Universal points
TXM1.8X-ML	TX-I/O Module, 8 Super Universal points with LOID
TXM1.6R	TX-I/O Module, 6 DO with Relay points
TXM1.6R-M	TX-I/O Module, 6 DO with Relay points with manual override

TX-I/O Power Supply and Bus Modules

Product Number	Description
TXS1.12F4	TX-I/O Power Supply, 1.2 A, 4A Fuse
TXS1.EF4	TX-I/O Bus Connection Module, 4A Fuse
TXA1.IBE	TX-I/O Island Bus Expansion Module with RS-485 connection.
TXB1.P1	TX-I/O Bus Interface Module, P1

Accessories

Product Number	Description
TXA1.K12	One set of address keys, numbers 1-12
TXA1.K24	One set of address keys, numbers 1-24
TXA1.K-48	One set of address keys, numbers 25-48
TXA1.K-72	One set of address keys, numbers 49-72
TXA1.LLT-P100	Labels for TX-I/O 100 sheets/pack Letter format
TXA1.LH	Replacement label holders

Regions where this Product is Sold

(US, Asia Pacific, Canada, Latin America, UK)

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Siemens Industry, Inc.
Building Technologies Division
1000 Deerfield Parkway
Buffalo Grove, IL 60089-4513
U.S.A

Your feedback is important to us. If you have comments about this document, please send them to SBT_technical.editor.us.sbt@siemens.com.

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Printed in the USA

SIEMENS

Technical Specification Sheet
Document No. 149-475
February 2009

PX Series Enclosures and Accessories

Figure 1. New PX Series Enclosures.

Enclosures

Description

PX series enclosures house both electronic and pneumatic components. The enclosures include a perforated backplane for mounting of the PXC series controllers, Power Modular Equipment Controllers, Point Expansion Modules or other electronic or pneumatic components.

Features

- Three sizes available to match installation needs.
- Sturdy construction accommodates secure conduit fittings and protects components against incidental contact and falling dirt.
- Multiple knockouts along top, sides and bottom.
- Perforated backplane extends wall-to-wall for mounting of additional equipment.
- DIN rail(s) for mounting of components.
- Spacious interior for easy routing and termination of wiring.
- Hinged door, key lock, wire tie bars, PXA series service boxes
- UL Smoke Control Listing is available on the 19” and 34” models.
- UL 916 rating is available on the 18’ enclosure
- 18” enclosure pull-box type, utility cabinet for low cost installations (see Figure 2).

Figure 2. Complete 18” Enclosure Assembly.

Accessories

Service Boxes

Description

PXA series service boxes include all of the parts necessary for installation inside a 19 inch or 34 inch PX Series Enclosure Assemblies. The 192VA service box can also be used within existing MEC enclosures. The 384VA service box may only be installed in the 34 inch PX Series Enclosure.

Figure 3. SB115V384VA service box .

Features

- Four service boxes are available to step-down line voltage to 24Vac for use by electronic components.
- Service boxes are sized for:
  - 115V to 24V at 192VA
  - 115V to 24V at 384VA
  - 230V to 24V at 192VA
  - 230V to 24V at 384VA
- 384VA models mount inside the 34” enclosures.
- 192VA models mount inside the 19” and 34” enclosures.
- Two sidewall kits cover exposed circuits for use in other NEMA Type 1 enclosures such as motor control cabinets.
- Each service box includes an on/off circuit breaker for the transformer, transient protection on both primary and secondary sides, two NEC Class 1 power limited terminations for components inside the enclosure and one NEC Class 2 termination for external components such as TX-I/O Bus expansion or actuators.
- The 115V models provide an un-switched duplex outlet to power peripheral devices such as modems, trunk interfaces and Portable Operator’s Terminals.
- UL864 Smoke Control rated when used in PXA Series Enclosure 19” or 34” or within existing MEC enclosures.

DIN Replacement Kit (PXA-DIN16KIT)

The DIN Replacement Kit can be used when additional 16” DIN rail is required.

This kit contains:

- Four 16” (406 mm) DIN rails for use when extra rails are needed
- Twelve Screws

Wire Tie Bar Kit (PXA-TIEBARKIT)

The Wire Tie Bar kit can be used when addition tie bars are needed to secure wiring within the enclosure.

This kit contains:

- Four 4.5” (114 mm) tie bars
- Four 9.5” (241 mm) tie bars
- Screws and cable ties

USB Modem Kit (PXA-USBMODEMKIT)

USB Modem kit contains everything needed for dial up modem connection using the USB Host port of the PXC Modular controller.

This kit contains:

- Sportsters Modem 56k BPS Dialup
- USB to RS232 Adapter
- Surge Suppressor Analog Telephone Line
- DB25M/F Right-Angle Adapter
- IBM 6’ PC Cable DB9F to DB25M

USB to RS232 Adapter (PXA-USBADAPTER)

USB to RS232 Adapter converts USB Host signals (Type A male connector) to RS232 signals (DB9 male connector).

This adapter may be used for connection to a RS232 printer. It is part of the PXA-USBMODEMKIT.

Specifications

Specifications	PXA-ENC18	PXA-ENC19	PXA-ENC34
UL Listed NEMA Type 1 Enclosure	X	X	X
Pull-box style	X		
Hinged Door with lock		X	X

Ambient Operating Environment			
+32°F to +120°F (0°C to +49°C) 93% RH (Non-condensing)	X	X	X

Agency Listing			
UL864 UUKL		X	X
ULC-C100 UUKL7		X	X
UL 916 PAZX		X	X
UL 508A	X		

Agency Compliance			
FCC Compliance	X	X	X
Australian EMC Framework	X	X	X
European EMC Directive (CE)	X	X	X
European Low Voltage Directive (LVD)	X	X	X
Dimensions	18”H × 14”W × 6”D (457.2 mm × 355.6 mm × 152.4 mm)	19”H × 22”W × 5.75”D (482.6 mm × 558.8 mm × 146.05 mm)	34”H × 22”W × 5.75”D (863.6 mm ×558.8 mm × 146.05 mm)

Mounting Surface			
Building Wall	X	X	X
Structural Member	X	X	X

Input Power Requirement	**115V Service Boxes**	**230V Service Boxes**
Voltage	115Vac +/- 15% @ 60 Hz +/- 5%, from 15 or 20A circuit breaker	230Vac +/- 15% @ 50/60 Hz +/- 5%, from 10A circuit breaker
Current	2A for 192VA, 4A for 384VA, 2A for 115Vac Service Outlets	1A for 192VA, 2A for 384VA

Ordering Information

Enclosure Range

Description	Product Number
18” PX Series Enclosure	PXA-ENC18
19” PX Series Enclosure	PXA-ENC19
34” PX Series Enclosure	PXA-ENC34

Accessories

Service Box 115V, 24 Vac, 192 VA	PXA-SB115V192VA
Service Box 230V, 24 Vac, 192 VA	PXA-SB230V192VA
Service Box 115V, 24 Vac, 384 VA	PXA-SB115V384VA
Service Box 230V, 24 Vac, 384 VA	PXA-SB230V384VA
Service Box Sidewall Kit, 192 VA	PXA-SW192VA
Service Box Sidewall Kit, 384 VA	PXA-SW384VA
Replacement door for 19” PX series enclosure	PXA-ENC19.REPL.DR
Replacement door for 34” PX series enclosure	PXA-ENC34.REPL.DR

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SIEMENS

Technical Instructions
Document No. 155-272P25
CP 567-7
November 12, 2007

Powers™ Controls

CP 567 Control Cabinets

Description

CP 567 Control Cabinets are designed to conveniently group control system components (Figure 1). Control components can be mounted on the door or mounted within the cabinet enclosure using the perforated mounting plate. Cabinets are available in four Sizes: 1, 2, 3 and 4. See Table 1 for product numbers and dimensions.

- The cabinet enclosure, door, and perforated mounting plate for Sizes 1, 3 and 4 may be ordered separately.
- The Size 1 cabinet enclosure is available in a flush mount version.
- Size 3 and 4 cabinets are available in 6-inch depth (for electronic installations) or 9-inch depth (for pneumatic installations).

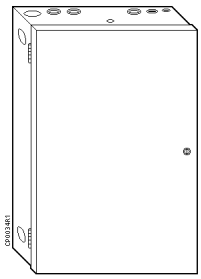


Figure 1. CP 567 Control Cabinet.

Table 1. Product Numbers.

Description			Product Numbers	Dimensions Inches (mm) H × W × D
	Size	Installation		
Cabinet Assembly	1	Pneumatic	567-351	19-1/2 (495) × 16-3/8 (416) × 5-3/4 (146)
	2	Electronic	567-454	20 (508) × 20 (508) × 6 (152)
	3	Pneumatic	567-352	24-5/16 (617) × 24-3/8 (619) × 9-3/8 (238)
	3	Electronic	567-452	24-5/16 (617) × 24-3/8 (619) × 6 (152)
	4	Pneumatic	567-353	36-1/2 (927) × 24-3/8 (619) × 9-3/8 (238)
	4	Electronic	567-453	36-1/2 (927) × 24-3/8 (619) × 6 (152)
Cabinet Door	1	Pneumatic	567-361	See Figure 4
	3	Either	567-362	
	4	Either	567-363	
Cabinet Enclosure	1	Pneumatic	567-371	See Figures 4 and 5
	3	Either	567-372	See Figures 4 and 5
	4	Either	567-373	
Flush Mount Cabinet	1	Pneumatic	567-391	See Figure 7
Flush Mount Door Kit	1	Pneumatic	567-390	See Figure 8
Perforated Mounting Plate	1	Pneumatic	567-381	–
	3	Either	567-382	
	4	Either	567-383	

Application

CP 567 Control Cabinets provide a convenient central location for equipment mounting, termination of piping, adjustment, and calibration.

The door and mounting plate can be separated from the cabinet enclosure. The empty cabinet enclosure can be installed at the job to permit early rough-in of conduit.

Controls may be mounted to the door and mounting plate either at the job site or at the office and attached to the cabinet enclosure at your convenience. After reassembly, final connections are made.

Cabinets may be used with pneumatic systems employing either copper or polyethylene tubing for transmission lines, with wired electric/electronic systems, or with a combination of both.

Pneumatic tubing within the cabinet enclosure should be polyethylene for a flexible connection to hinged door components and for easy installation and arrangement.

Features

- Cabinets are symmetrical; therefore, they can be mounted with the door hinge on the left or right hand side.
- Door is removable.
- Attractive gray finish permits use in occupied areas.
- Removable perforated mounting plate permits mounting controls inside the cabinet without drilling holes.
- All cabinets can be wall or floor mounted.
- Support kits are available for floor mounting (medium and large cabinets only).
- Knockouts are provided for electrical or pneumatic piping.
- Cabinets are listed under UL 508 Industrial Control Panel Enclosures.
- CSA approved file LR84214.
- NEMA TYPE 1 style of enclosure.
- Height and width dimensions and cabinet color are the same for automation and pneumatic cabinets for a uniform look and mounting.

Specifications

Cabinet Sizes	See Table 1
Dimensions:	
Cabinet, Door, Subpanel	See Figures 4 through 8 and Tables 6 and 7
Supports	See Figure 6
Mounting:	
Wall	See Figure 4 and Table 6
Floor	See Figure 5
Flush (in wall)	See Figures 7 and 8 and Table 7

Specifications, Continued

Knockouts-Electrical Conduit Size:	
Size 1 and Flush Mount Cabinets	
Top	(3) 1-1/4 or 1-1/2, (1) 3/4 or 1, (2) 1/2 or 3/4, (1) 7/16
Bottom	(3) 1-1/4 or 1-1/2, (1) 3/4 or 1, (2) 1/2 or 3/4, (1) 7/16
Right Side	(2) 2
Left Side	(2) 2
Size 2, Size 3 and Size 4 Cabinets	
Top	(1) 2, (3) 1-1/4 or 1-1/2, (1) 3/4 or 1, (1) 1/2 or 3/4, (1) 7/16
Bottom	(1) 2, (3) 1-1/4 or 1-1/2, (1) 3/4 or 1, (1) 1/2 or 3/4, (1) 7/16
Right Side	(2) 2
Left Side	(2) 2
Material (Steel):	
Cabinet (Size 1, 2, 3 and Flush Mount)	16 gauge 0.0598 (1.5 mm)
Door (Size 1, 2, 3 and Flush Mount)	16 gauge 0.0598 (1.5 mm)
Cabinet (Size 4)	14 gauge 0.0747 (1.9 mm)
Door (Size 4)	14 gauge 0.0747 (1.9 mm)
Mounting Plate	16 gauge 0.0598 (1.5 mm)
Supports	14 gauge 0.0747 (1.9 mm)
Finish	Gray
Weight:	
Size 1 Cabinet Assembly	20 lb (9 kg)
Size 2 Cabinet Assembly	28 lb (13 kg)
Size 3 Cabinet Assembly	39 lb (18 kg)
Size 4 Cabinet Assembly	72 lb (33 kg)
Flush Mount Enclosure	20 lb (9 kg)
Flush Mount Kit	8 lb (3.6 kg)
Support Legs	See Table 2

Accessories

Replacement Door Lock and Key Assembly	567-225
Floor Mount Support Kit (2 supports, hardware)	See Table 2
Touch-up Spray Paint, 16 oz Can	
Gray	544-459
Blue	534-500
Cabinet Light	See I.D. Number 3296 in the Field Purchasing Guide

Table 2. Floor Mount Support Kit.

Cabinet Size to be Supported	Support Size		Order Number
	Height	Weight	
Size 3	49 inches (1245 mm)	40 lb (18 kg)	567-335
Size 4	37 inches (940 mm)	30 lb (14 kg)	567-334

NOTE: The six-inch deep cabinets do not have floor mount support kits.

Door Layout

NOTE: Controls cannot be mounted to the door of the flush mount cabinet.

Perform the following steps when preparing to lay out a cabinet door:

1. Determine controls to be mounted on the door.
2. Determine if the controls mounted in the door will clear the mounting plate when tubing or wires are attached. See Figure 3 and Table 5 for dimensions. Table 4 provides the approximate space requirements for controls frequently mounted in the door.
3. Determine if the total weight of the controls, (see Table 4) to be mounted on the door are within the maximum weight limitations shown in Table 3. If weight limitations are exceeded, the door might sag and prevent proper closure.

Table 3. Weight Limitations.

Cabinet Size	Maximum Weight of Controls That Can Be Mounted on Door lb (Kg)	Maximum Number of Selector Switches That Can Be Mounted on Door
Size 1	21 (9.5)	14
Size 2	24 (11)	16
Size 3	30 (14)	20
Size 4	93 (42)	62

Cabinet Installation (Non-flush mount)

1. There are four keyhole mounting holes in the back surface of the cabinet. Their sizes and locations are shown in Figure 5. Use wall anchors that are suitable to support the weight of the cabinet and its contents.
2. If more than one cabinet is to be mounted in the same location, allow at least 2 inches (51 mm) between cabinets to provide space for doors to open properly.
3. The cabinets are symmetrical before cutouts have been made, so the door can be mounted with the hinge on the left or right side.
4. Determine the size of the knockouts required for the number and size of pneumatic tubes and wires to be brought into the cabinet.
5. If more than one knockout is required, divide the tubes and wires for easy connection to the controls.
6. If a cabinet light is required, order per instructions under accessories. The recommended mini work light has a 2-inch diameter by 4-inchlong (51 mm × 102 mm) bulb holder on a 15-inch (381 mm) long flexible metal arm.
   a. Remove the plug and mounting bracket from the light.
   b. Punch out the 7/16-inch (11 mm) diameter knockout in the center of the top of the cabinet.
   c. Attach the light using the nut and washer provided with it.
   d. Wire the light cord in compliance with local electrical codes.

Controls Installation

NOTE: It might be easier to remove the door from the cabinet and then mount the controls onto the door or the mounting plate.

1. The space required for the controls mounted in the door or the mounting plate is shown in Table 4. Space available between the door and the mounting plate is shown in Figure 4, Table 5, and Table 6.

2. Arrange the controls on the mounting plate to avoid interference with the controls on the door. Arrange the controls in logical groupings for easy access to fitting and wiring terminals. Table 4 shows the approximate space required for controls frequently mounted on the mounting plate in the cabinet.

3. In some cases it might be easier to remove the mounting plate to mount the controls.

4. Mount the controls to the perforated mounting plate with standard sheet metal screws.

5. When routing tubing or wires from the controls mounted on the door, allow sufficient slack to prevent excessive stress.

6. Bundle and tie tubing and wires separately.

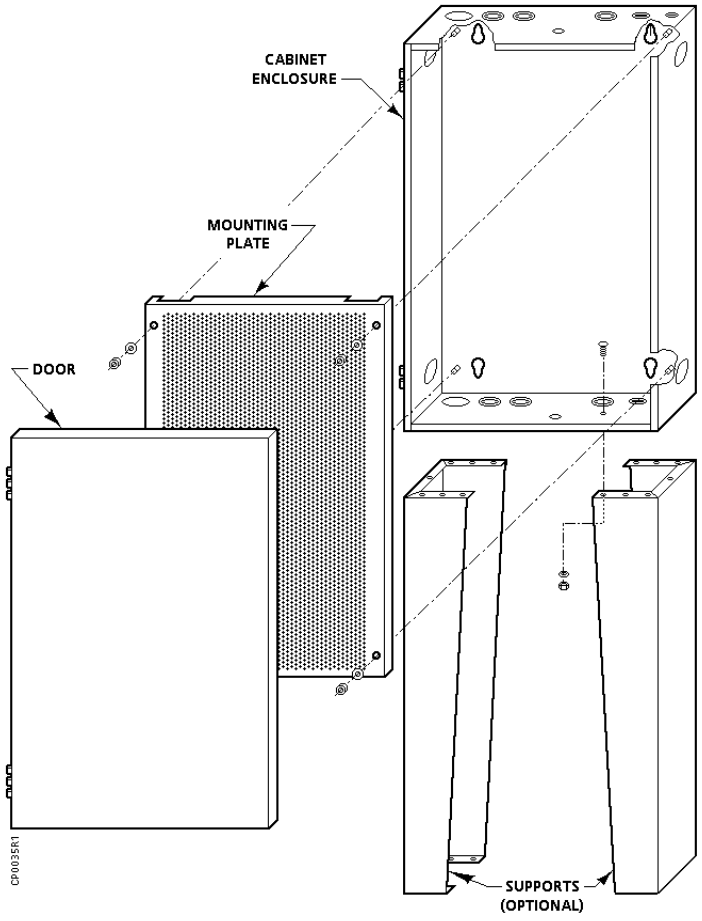


Figure 2. Wall Mount Cabinet Components.

Cabinet Installation (Flush Mount)

1. Mount the cabinet in a wall at least 6 inches (15.2 cm) deep. There are four keyhole mounting holes in the back surface of the cabinet. Their sizes and locations are shown in Figure 5. Use wall anchors that are suitable to support the weight of the cabinet and its contents.

2. Determine the size of the knockouts required for the number and size of pneumatic tubes and wires to be brought into the cabinet.

3. The cabinets are symmetrical before cutouts have been made, so the door can be mounted with the hinge on the left or right side.

4. If more than one knockout is required, divide the tubes and wires for easy connection to the controls.

5. If a cabinet light is required, order per instructions under accessories. The recommended mini work light has a 2-inch diameter by 4-inch long (51 mm × 102 mm) bulb holder on a 15-inch (381 mm) long flexible metal arm.

   a. Remove the plug and mounting bracket from the light.

   b. Punch out the 7/16-inch (11 mm) diameter knockout in the center of the top of the cabinet.

   c. Attach the light using the nut and washer provided with it.

   d. Wire the light cord in compliance with local electrical codes.

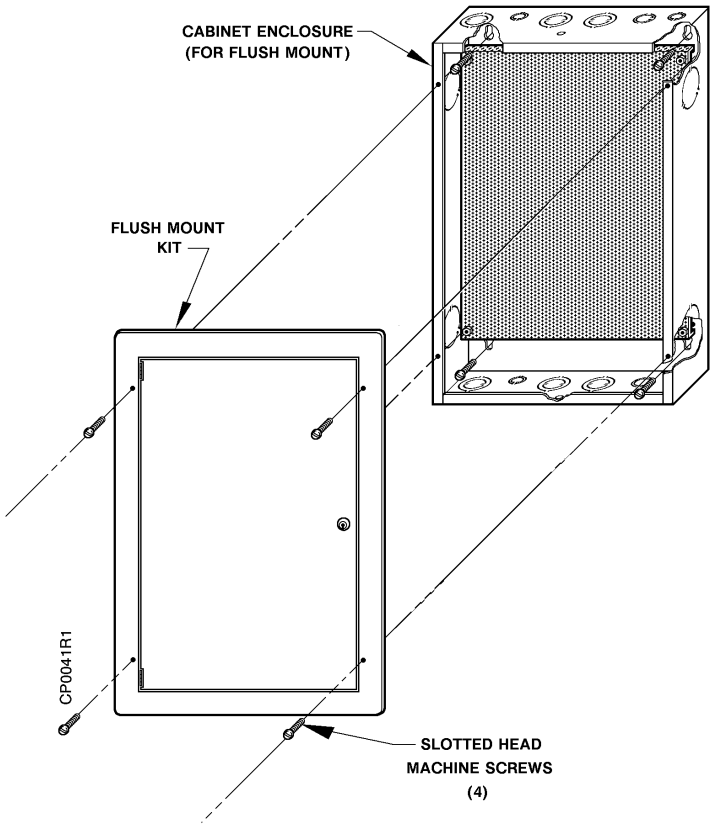


Figure 3. Flush Mount Cabinet Components.

Table 4. Approximate Panel Space Requirements (Includes Fitting and Clearances).

Equipment	Door Mounting Depth Inches (mm)	Equipment Weight Pounds (kg) (See Note 3)	Mounting Plate Depth Inches (mm)	Inside Area Required Inches^2 (cm^2)
6 Input Sig. Selector	–	–	4 (102)	12 (77)
656 Pilot Valve	–	–	3 (76)	100 (645)
ARG 61.00 Wall Mount Case	–	–	8.52 (216.4)	13.10 (84.5)
ARG 61.01 Panel Mount Case	7.52 (191)	1.65 (0.750)	–	11.28 (72.8)
D.P. Switch	–	–	3 (76)	45 (290)
Diff. Press. Reg.	–	–	3 (76)	35 (226) (See *Note 1*)
E.P.	–	–	1-1/4 (32)	30 (194)
Electric Relay	–	–	4 (102)	30 (194)
Enthalpy Comparator	–	–	3-1/2 (89)	30 (194)
FZA 21 Remote Setting Unit	0.87 (22)	0.11 (0.05)	–	1.98 (12.76)
FZA 61 Remote Setting Unit	1.10 (28)	0.15 (0.07)	–	3.00 (19.36)
Gauges 1-1/2"	2 (51)	0.2 (0.09)	1-1/2 (38)	4 (26) (See *Note 2*)
Gauges 2-1/2"	2-1/2 (64)	0.5 (0.22)	–	–
Gauges 3-1/2"	2-1/2 (64)	0.6 (0.27)	–	–
Min (PRV)	3 (76)	0.5 (0.22)	2 (51)	10 (65)
MP, BR, Analog Relays	4-1/2 (114)	2 (0.91)	2-1/2 or 5 (64 or 127)	42 (271)
P.E. (Single)	–	–	3-1/2 (89)	28 (181)
Positioning/Selector Switch	3 (76)	2 (0.91)	5 (127)	10 (65) (See *Note 2*)
PRV (Powers)	–	–	5-1/2 (140)	100 (645)
RC 195	–	–	3-1/2 (89)	6 0(387)
Static Pressure Reg.	–	–	4 (102)	30 (194)
Switching Relay	–	–	2-1/2 (64)	65 (419)

NOTES: 1. Normally not mounted inside of the cabinet.
2. If mounted inside of the cabinet.
3. Weights are given for door mounted devices only.

Table 5. Usability.

Product Numbers	Cabinet Enclosure	Inside Depth Door to Mounting Plate Inches (mm)	Maximum Usable Area Inches^2 (cm^2)	Maximum Number of RC-195 Per Cabinet
567-351	Size 1	5 (127)	172 (1109)	3
567-391	Flush Mount	4-5/8 (117)	172 (1109)	3
567-454	Size 2	5-1/2 (140)	227 (1465)	4
567-352 567-452	Size 3	8-1/2 (216) 5-1/2 (140)	380 (2451)	6
567-353 567-453	Size 4	8-1/2 (216) 5-1/2 (140)	615 (3967)	10

Dimensions

Dual Knockouts		
Type	Nominal Conduit Size Inches (mm)	Knockout Diameter Inches (mm)
1	1/2 & 3/4 (13 & 19)	0.875 & 1.109 (22 &28)
2	3/4 & 1 (19 & 25)	1.109 & 1.375 (28 & 35)
3	1-1/4 & 1-1/2 (32 & 38)	1.734 & 1.984 (44 & 50)
4	2 (51)	2.469 (63)
5	–	0.437 (11)

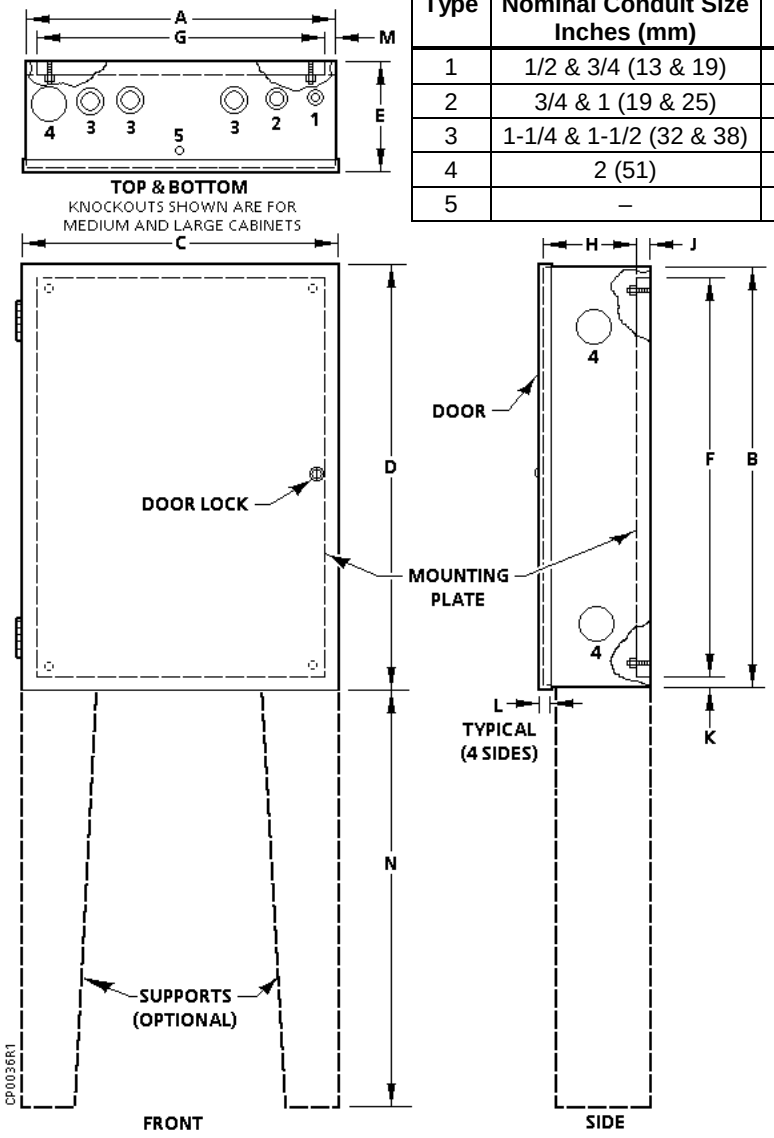


Figure 4. Cabinet and Support Dimensions (See Table 5 and Figure 9).

Dimensions, Continued

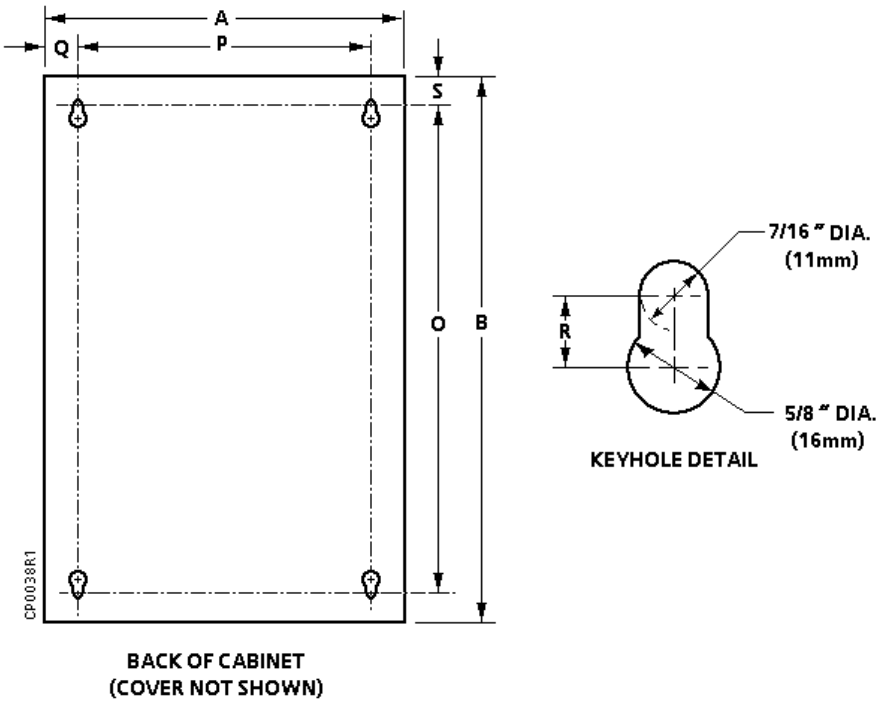


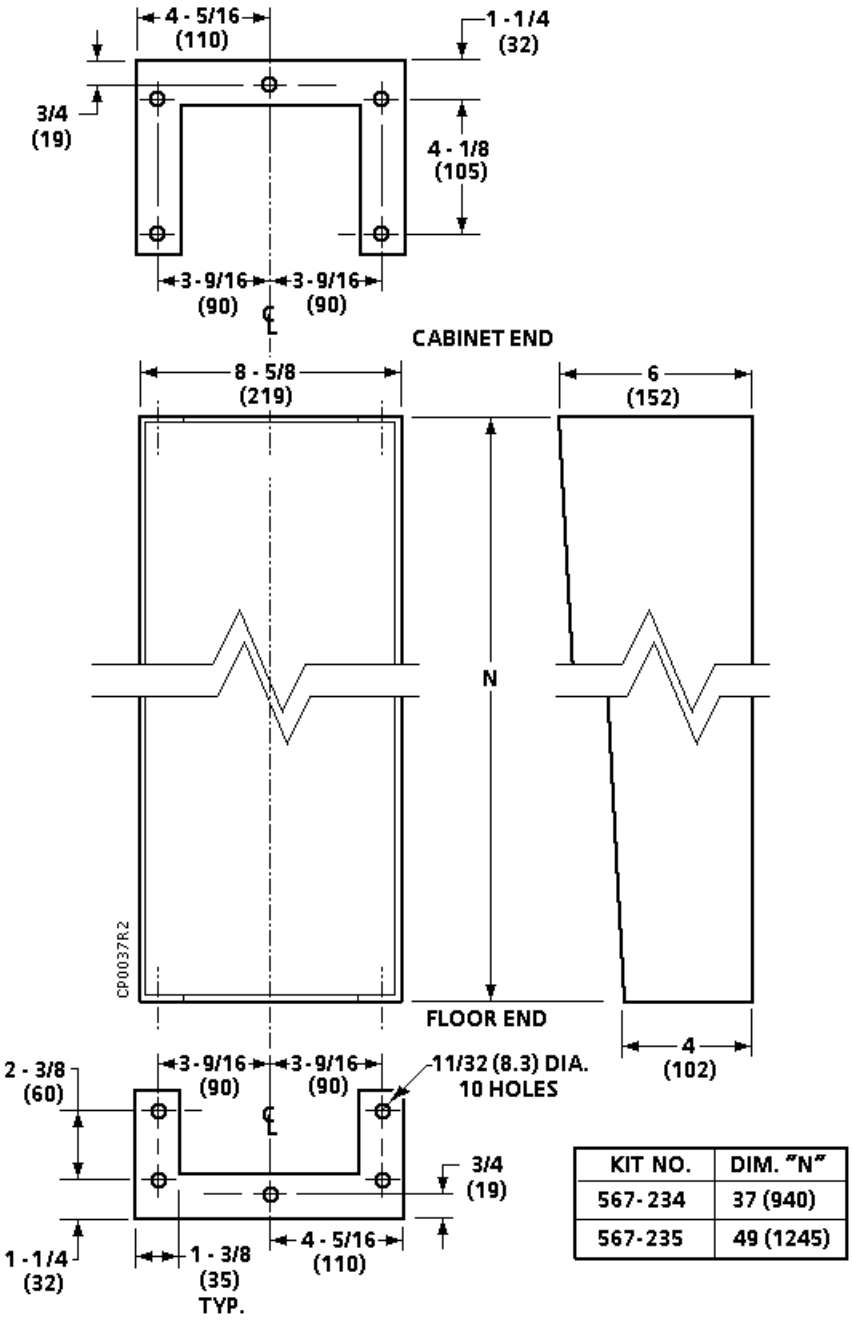
Figure 5. Rear View of Cabinet (See Table 6).

Table 6. Cabinet Assembly Dimensions (See Figures 4, 5, and 6).

Cabinet Assembly		Dimensions Inches (mm)									
Product Number	Size	A	B	C	D	E	F	G	H	I	J
567-351	Size 1	16 (406)	19 (483)	16-3/8 (416)	19-1/2 (495)	5-3/4 (146)	14-1/2 (368)	14-3/4 (375)	5 (127)	5-11/16 (145)	1/2 (13)
567-454	Size 2	20 (508)	20 (508)	20-5/16 (516)	20-5/16 (516)	6 (152)	19 (483)	15.25 (387)	5-3/8 (137)	5-7/8 (149)	1/2 (13)
567-352 [567-452]	Size 3	24 (610)	24 (610)	24-3/8 (619)	24-5/16 (617)	9-3/8(238) [6 (152)]	19-1/4 (489)	23 (584)	8-1/2 (216)	9-1/4(235) [5-7/8 (149)]	1/2 (13)
567-353 [567-453]	Size 4	24 (610)	36 (914)	24-3/8 (619)	36-1/2 (927)	9-3/8(238) [6 (152)]	31-1/2 (800)	22 (559)	8-1/2 (216)	9-1/4(235) [5-7/8 (149)]	1/2 (13)
Product Number	**Size**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**–**
567-351	Size 1	2-1/4 (57)	3/4 (19)	5/8 (16)	*	16-1/2 (419)	13-1/2 (343)	1-1/4 (32)	1/2 (13)	1-1/4 (32)	–
567-454	Size 2	2-1/4 (57)	3/4 (19)	1/2 (13)	-	17.5 (445)	12 (305)	4 (102)	1/2 (13)	1-1/4 (32)	–
567-352 [567-452]	Size 3	2-1/4 (57)	3/4 (19)	1/2 (13)	49 (1245)	21 (533)	16 (406)	4 (102)	1/2 (13)	1-1/2 (38)	–
567-353 [567-453]	Size 4	2-1/4 (57)	3/4 (19)	1 (25)	37 (940)	33-1/2 (851)	16-314 (425)	3-5/8 (92)	1/2 (13)	1-1/4 (32)	–

* See Figure 6 for dimensions of "N"

Dimensions, Continued



KIT NO.	DIM. "N"
567-234	37 (940)
567-235	49 (1245)

Figure 6. Floor Mount Support Legs Kit. Dimensions in Inches (mm).

Dimensions, Continued

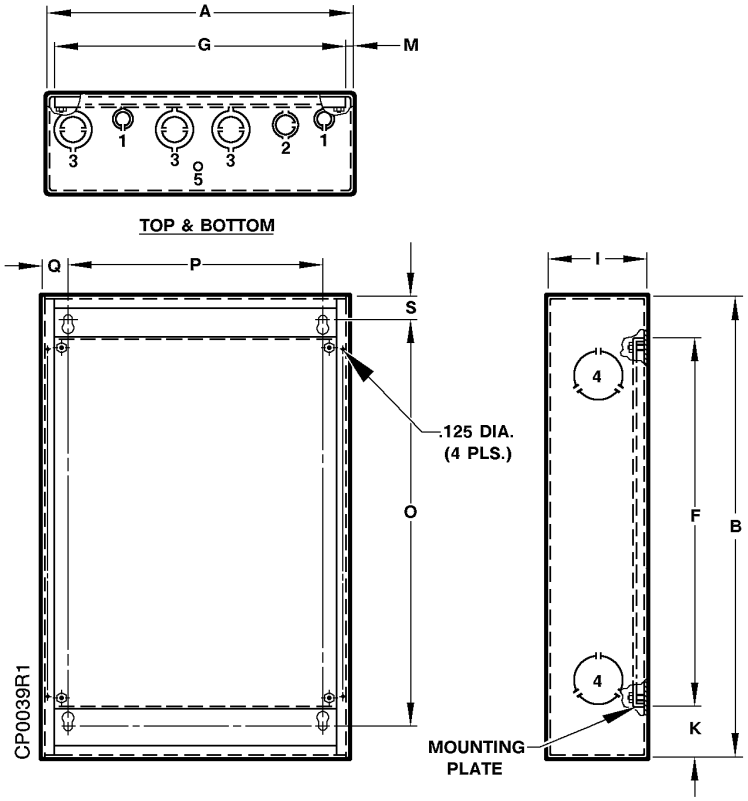


Figure 7. Flush Mount Cabinet Dimensions (See Table 7).

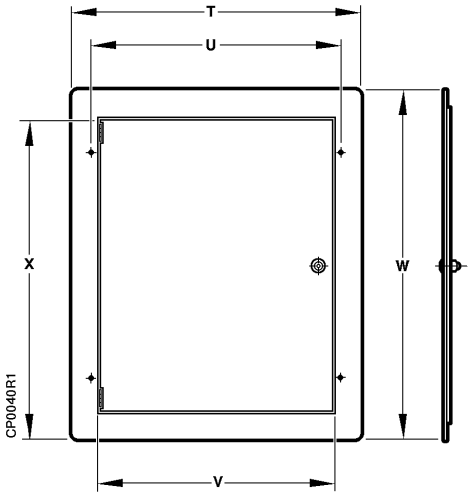


Figure 8. Flush Mount Door Dimensions (See Table 7).

Table 7. Flush Mount Cabinet and Door Dimensions.

Dimensions in Inches (mm)							
A*	**B***	**F**	**G**	**I**	**K**	**M**	**O**
16-1/8 (410)	19-1/2 (495)	13-1/2 (343)	14-3/4 (375)	5-1/8 (130)	1-1/2 (38)	1-11/16 (43)	16-1/2 (419)
P	**Q**	**S**	**T***	**U**	**V**	**W***	**X**
13-1/2 (343)	1-1/4 (32)	1-1/4 (32)	18 (457)	15-7/16 (392)	14-3/4 (375)	21-3/8 (543)	18-1/8 (460)

* Cutout dimensions; make cutout at least the size of dimensions A and B (cabinet size) but no larger than T & W (door size).

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SIEMENS

Technical Specification Sheet
Document No. 149-312P25
January 5, 2012

Room Temperature Sensors, Series 1000 and Standard Design and Semi-Flush Mount Series 2000 (Interactive)

Figure 1. Room Temperature Sensor--Series 1000 Shown with All Available Options.

The **Series 1000** and **Series 2000** Room Temperature Sensors from Siemens Building Technologies, Inc., offer a wide range of features and functionality that work in concert with the APOGEE® Automation System to deliver exceptional occupant comfort in even the most demanding application environments. The product family includes plain sensing-only variants, and fully interactive types with a two-line LCD that permits viewing and modifying controller points directly from the sensor's keypad and display as well as a semi-flush mount model (Series 2000). All sensors incorporate precision temperature sensing elements to accurately and reliably measure room temperature. Their compact, low profile design results in an attractive, inconspicuous installation. A styled ventilation ring optimizes airflow through the cover for fast measurement response and superior control.

Series 1000

The **Series 1000** Room Temperature Sensor provides accurate, reliable sensing of room temperature Terminal Equipment Controllers (TECs), Modular Building Controllers (MBCs), Remote Building Controllers (RBCs), Programmable Modular Controllers (PXCs) and Modular Equipment Controllers (MECs).

TEC Applications

Room temperature sensors for TEC applications incorporate a thermistor element and plug-in Portable Operator's Terminal port located on the bottom of the cover. The plug-in Portable Operator's Terminal port provides a convenient means of communicating with the TEC to command or troubleshoot the system. These sensors connect to TECs via a six-wire cable terminated with a plug-in RJ-11 connector. The cable transmits the temperature, the communication with the Portable Operator's Terminal, and the optional setpoint and override signals.

MBC, RBC, PXC, and MEC Applications

Room temperature sensors for MBC, RBC, PXC and MEC applications incorporate a platinum RTD element. Connections to field panels are made via 18 to 22 AWG twisted pair cabling. A conveniently located unpluggable termination block simplifies both installation and service.

Optional Features

- Digital temperature display: The digital temperature display provides an easy-to-read room temperature value in degrees Fahrenheit or Celsius.
- Setpoint adjustment: The high accuracy setpoint adjustment incorporates dual temperature scale indication and an access door that covers the setpoint adjustment switch.
- Override button: The flush mounted override button allows an occupant to change to an occupied control schedule during the unoccupied cycle for a predetermined time period.
- Maintenance free: These sensors draw a small amount of power directly from the controller and do not use batteries. This eliminates the cost of battery replacement and disposal.

Specifications (Series 1000)

Temperature Range	
Setpoint	55°F to 95°F (13°C to 35°C)
Operating	55°F to 95°F (13°C to 35°C)
Output Signals	Changing resistance
Sensing Element Type	
540 Models	10K NTC Thermistor (Type II)
544 Models	1K Platinum RTD (375 ALPHA)
Accuracy	
10K ohm Thermistor	
55 - 80.6°F (13 - 27°C)	±0.5°F (±0.3°C)
80.6 - 95°F (27 - 35°C)	±1.0°F (±0.5°C)
1,000 ohm RTD mid-range	
75°F (24°C)	±0.75°F (± 0.4°C)
Calibration Adjustments	None required
Installation	
TEC	100 ft. Maximum cable length. 6C #24 AWG, Belden 1228A or equal, NEC Class 2
MBC/RBC/PXC/MEC	300 to 750 ft Max. cable length 18 to 22 AWG twisted pair NEC Class 2
Installation Adjustments	None required
Cover	
Dimensions	3-11/32" H × 2-1/2" W × 1-1/2" D (85 mm × 63 mm × 38 mm)
Color	Desert beige or white
Power Consumption[1] 544-7xx units	8.6 mW maximum

1 Power consumption values apply only to those units with single line display.

Figure 2. Room Temperature Sensor and Semi-Flush Mount Room Temperature Sensor--Series 2000.

Series 2000

The **Series 2000** Room Temperature Sensors provide an interactive digital link to Terminal Equipment Controllers (TECs) that allows viewing and adjusting controller points directly from the sensor's liquid crystal display and keypad. These sensors incorporate a precision thermistor to accurately and reliably measure room temperature.

NOTE: The Semi-Flush Mount Sensor can only be mounted in a 2 × 4 box without a gang riser/ring.

Standard Features

- Programmable Liquid Crystal Display (LCD): A two-line alphanumeric LCD allows simultaneous display of room temperature, a user-selected critical point, and day/night operation status. You can configure the screen to:
  - show English or metric units,
  - turn the room temperature display on or off,
  - select a critical point for display, or
  - turn off the critical point display.
- Digital setpoint adjustment: The sensor's keypad allows error-free digital setpoint adjustments in one-degree increments. Setpoint values momentarily display as changes are made.
- Display of operating mode: Graphic symbols are displayed to indicate the controller's operating mode. A "sun" indicates occupied mode operation and a "moon" indicates night mode operation.
- Override button: A flush-mounted override button allows you to change to an occupied control schedule during the unoccupied cycle for a period of time determined by the system operator.

Standard Features, Continued

- Passkey security: A special hardware passkey plugs into the sensor's MMI port to allow access to the display configuration menu and the controller's point database.

NOTE: The Semi-Flush Mount Sensor MMI port can only be accessed after the front housing is removed.

  – Backward compatibility: These sensors are backward compatible with all TECs. The sensors are wired with six-conductor phone cables and standard RJ-11 connectors.

  – Maintenance free: These sensors draw a small amount of power directly from the controller and do not use batteries. This eliminates the cost of battery replacement and disposal.

Specifications (Series 2000)

Effective Sensing and Setpoint Range (TEC)	55°F to 95°F (13°C to 35°C)
Output Signals	Changing resistance
Room temperature	Changing resistance
Setpoint	Digital
Thermistor Calibration Point (TEC)	77°F (25°C)
Accuracy (10K ohm Thermistor)	
55 - 80.6°F (13 - 27°C)	±0.5°F (±0.3°C)
80.6 - 95°F (27 - 35°C)	±1.0°F (±0.55°C)
Accuracy (QAA1280.FWSC)	
60°F - 85°F (140°C - 185°C)	+3°F (1.7°C)
Other temperature ranges	+4°F (2.2°C)
Resistance value	10K Ω ohms
Calibration	None required
Installation (TEC)	100 ft maximum cable length 6C #24 AWG, NEC Class 2
Installation Adjustments	None required
Dimensions	3-11/32" H × 2-1/2" W × 1-1/2" D (85 mm × 63 mm × 38 mm)
Color	Desert beige or white

Product Ordering Information

TEC Description	Product Part Number
Series 1000	
Sensing only	540-660[1]
Sensing only, no logo. White	540-661B
Sensing with override and setpoint	540-670[1]
Sensing with override and setpoint, no logo	540-671[1]
Sensing with override, setpoint and temperature display	540-680[2]
Series 2000	
TEC Sensor	540-650[1]
Semi-Flush Mount Room Temperature Sensor, TEC	QAA1280.FWSC
MBC/RBC/PXC/MEC, Series 1000 Description	**Product Part Number**
Sensing only	544-760[1]
Sensing with override, setpoint	544-770[1]
Sensing with override, setpoint, temperature display	544-780[2]

[1] Add letter suffix to indicate desired color: A=Desert Beige, B=White (for example, 540-660A).

[2] Add letter suffix to indicate temperature display units and color: F=°F, C=°C, A=Desert Beige, B=White (for example, 540-680FA).

Accessories Ordering Information

Description	Product Part Number
Occupancy Override Button, 25-pack (Beige)	544-480A
Occupancy Override Button, 25-pack (White)	544-480B
Setpoint Door, 25-pack (Beige)	544-481A
Setpoint Door, 25-pack (White)	544-481B
Blank Bezel, 25-pack (Beige)	544-482A
Blank Bezel, 25-pack (White)	544-482B
Room Temperature Sensor Repair Kit, Single-pack (Beige)	544-483A
Room Temperature Sensor Repair Kit, Single-pack (White)	544-483B
Blanking Override Button, 25-pack (Beige)	544-484A
Blanking Override Button, 25-pack (White)	544-484B
Passkey for Series 2000 Room Temperature Sensors	544-643A
Single Adapter Base Kit (White)	544-782B
Single Adapter Base Kit (Beige)	544-782A
Double Adapter Base Kit (White)	544-783B
Double Adapter Base Kit (Beige)	544-783A
Extender Ring Kit (White)	544-785B
Extender Ring Kit (Beige)	544-785A
Non-Conduit Rough-In Kit	544-784
Series 2000 (Interactive) Room Temperature Sensors, User Guide	129-363
Sensor Power Supply Module (for MBC applications with digital display option)	PTX6.4SPS
Available with vinyl or plenum jacket in 25-foot, 50-foot and 100-foot lengths. Contact your local Siemens Industry, Inc. field office for more information.	TEC room sensor cables (6 conductor w/RJ-11 connectors on each end)

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Siemens Industry, Inc.
Building Technologies Division
1000 Deerfield Parkway
Buffalo Grove, IL 60089-4513
USA
+1-847-215-1000

SIEMENS

Technical Specification Sheet
Document No. 149-181P25
August, 2012

Unit Conditioner Controller

Figure 1. Unit Conditioner Controller.

The Unit Conditioner Controller (Figure 1) controller provides high performance Direct Digital Control (DDC) of pressure dependent boxes, fan coil units, and induction units. The Unit Conditioner Controller can operate stand-alone or can be networked to perform complex HVAC control, monitoring, and energy management functions. This controller is designed to reside on the Siemens control system.

Features

- Advanced PID algorithm for the temperature control loops is employed to provide stability and to reduce unnecessary changes in the Flow setpoint when the room temperature is at or near the room temperature setpoint
- Unique control algorithms for specific applications
- Plenum rated controller
- Setpoints and control parameters assigned and changed locally or remotely
- Setpoints and control parameters stored in Electrically Erasable Programmable Read Only Memory (EEPROM)—no battery backup required
- Returns from power failure without operator intervention
- Meets low duct static pressure requirements
- No calibration required, thereby reducing maintenance costs
- Secure Mode (P/N 540-110C) prevents unauthorized users from making changes to the controller through the HMI port or room sensor (supports FDA 21 CFR Part 11 compliance – guidelines for protection of electronic records)
- Applications in P/N 540-110C include a user-adjustable offset for the room temperature reading when required for validation purposes
- UL and cUL Listed for Smoke Control

Applications

- Pressure Dependent Terminal Boxes:
  - Heating or Cooling
  - Hot Water Reheat
- Fan Coil Units:
  - Heat or Cool
  - Heating and Cooling
  - Three-Stage Electric Heat & Chilled Water
  - Three-Stage Electric Heat and Two Stage Cooling
  - Hot Water Heat and Two-Stage Cooling
- Induction Units

Control algorithms are preprogrammed. The controller is ready to operate after selecting the application and assigning the unit's controller address. If desired, the operator may adjust the air volume setpoints in cfm (l/s), room temperature setpoints and other

parameters. The controller is designed for operation and modification without vendor assistance.

Secure Mode Features

Secure Mode

The Unit Conditioner Controller is also offered with an optional feature, Secure Mode (P/N 540-110C). Secure Mode prevents unauthorized users from making any changes to the controller through the HMI port or room sensor. This functionality allows the controller to support FDA 21 CFR Part 11 compliance - guidelines for protection of electronic records.

Hardware

Controller Board

The Unit Conditioner Controller consists of an electronic controller assembly. This controller provides all wiring terminations for system and local communication, and power. The cable from the room sensor (purchased separately) connects to the RJ-11 jack on the controller. All other connections are removable blocks. The controller assembly is mounted on a plastic track that mounts directly on the fan coil unit, induction unit, or pressure dependent box. An optional enclosure (P/N 550-002) protects the controller assembly.

The controller interfaces with the following external devices:

- Floating control valve and damper actuators
- Temperature sensors (room, pipe, and duct)
- Service and commissioning tools
- Digital input devices (dry contacts from motion sensors, alarm contacts)
- Digital output devices (fan, stages of heat or stages of DX cooling)

Room Sensor

The room sensor connection to the controller board consists of a quick-connect RJ-11 jack. This streamlines the installation and reduces controller start-up time.

Unit Conditioner Controller Specifications

Power Requirements	
Operating Range	19 to 27.6 Vac 50 or 60 Hz
Power Consumption	60 VA maximum @ 24 Vac
Input	
Analog	1 room temperature sensor 1 setpoint (optional) 1 auxiliary temperature sensor
Digital	2 dry contact
Output	6 DO 24 Vac optically isolated solid state switch @ 0.5 Amp (0.25 Amp for Smoke Control)
Controlled Temperature Accuracy, Heating, or Cooling	± 1.5°F (0.9°C)
Dimensions	4-1/8" W x 7-3/4" L x 1-1/2" H (105 mm x 197 mm x 38 mm)
Weight	Approx. 3 lbs. (1.35 kg)
Communications	
Remote	FLN Trunk
Local	WCIS
Ambient Conditions	
Shipping & Storage Temperature	-13°F to 158°F (-25°C to 70°C)
Operating Temperature	32°F to 122°F (0°C to 50°C)
Humidity Range	5 to 95% rh (non-condensing)
Agency Listings	CE, C-tick
UL Listing	UL 916 PAZX
CUL Listed	UL 864, UUKL
CSA Certified	
FCC Compliance	

Pneumatic Transducer

The PTS Pneumatic Transducer contains the transducers that provide the signal conversion from electronic to pneumatic. The module is piped to the pneumatic actuator and wired to the Unit Conditioner Controller. This transducer provides for accurate control of pneumatic actuators for precise temperature and air volume control.

Pneumatic Transducer Specifications

Maximum Input Pressure	30 psi (207 kPa)
Air Consumption	0 SCIM
Power Consumption	4 VA @ 24 Vac max.
Dimensions	3-1/2" L x 2-1/4" W x 1-1/2" H (87 mm x 57 mm x 38 mm)
Weight	9 oz (0.3 kg)

Product Ordering Information

Description	Product Part Number
Unit Conditioner Controller	540-110
Unit Conditioner Controller with Secure Mode	540-110C
Smoke Control Listed Unit Conditioner Controller	540-110K
Smoke Control Listed Unit Conditioner Controller with Secure Mode	540-110CK
Smoke Control Listed Large Equipment Controller Enclosure	550-002K
Smoke Control Listed Small Equipment Controller Enclosure	540-155K
UL Listed Class 2 transformer with 120/240/277/480 Vac 50/60 HZ 0.4A primary w/ hub and 24Vac 50VA secondary w/ hub and circuit breaker for use with Smoke Control Listed Equipment Controllers	5041MWCB (SBT P/N MUC0240502TFCB)
UL Listed Class 2 transformer with 120/240/277/480 Vac 50/60 HZ 0.5A primary w/ hub and 24Vac 96VA secondary w/ hub and circuit breaker for use with Smoke Control Listed Equipment Controllers	10041MWCB (SBT P/N MUC0241002TFCB)
Pneumatic Transducer	PTS4

Document Information

Specification Sheet/Application Bulletin	Document Part Number
Room Temperature Sensors – Series 1000	149-312P25
Open Air Damper Actuators	155-188P25 (GDE/GLB131.1P)
Siemens Valves and Electronic Actuators: Powermite 599 Series – MT Series Terminal Unit Valve and Actuator Assembly Selection	155-306P25

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Siemens Industry, Inc.
Building Technologies Division
1000 Deerfield Parkway
Buffalo Grove, IL 60089
+ 1 847-215-1000

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Document No. 149-181P25
Printed in the U.S.A.

SIEMENS

Installation Instructions
Document No. 550-196
December 15, 2004

Terminal Equipment Controller Enclosure

Product Description

A Terminal Equipment Controller enclosure is a general-purpose metal cabinet with a removable cover that houses an electronic output Terminal Equipment Controller (TEC). It is available in two versions: one to enclose a short platform TEC, and a larger multi-purpose model designed to enclose any of the following:

- Short platform TEC with or without actuator
- Long platform TEC
- TEC Actuator Package
- TEC Plug-in Relay Module (either direct or remote mounted)

Product Number

540-155	Enclosure for short platform TEC
550-002	Multi-purpose enclosure for short or long platform TEC and/or other components listed above

Agency Approvals

- UL listed as an industrial control panel enclosure per UL 508
- cUL certified as an industrial control panel enclosure per Canadian standard C22.2 No.14–95

Required Tools

- 1/4-inch hex nut driver
- If supplied screws are not used: electric drill and appropriate size bit
- Medium flat-blade screwdriver

Prerequisites

The mounting screws provided are designed for common sheet-metal duct surfaces. Have appropriate mounting hardware on hand if another surface is used.

Instructions

1. Remove enclosure cover.

   NOTE: Enclosure 540-155 has cover screws that should be loosened but not removed. Enclosure 550-002 has no cover screws; see Figure 5 for tip on removing cover.

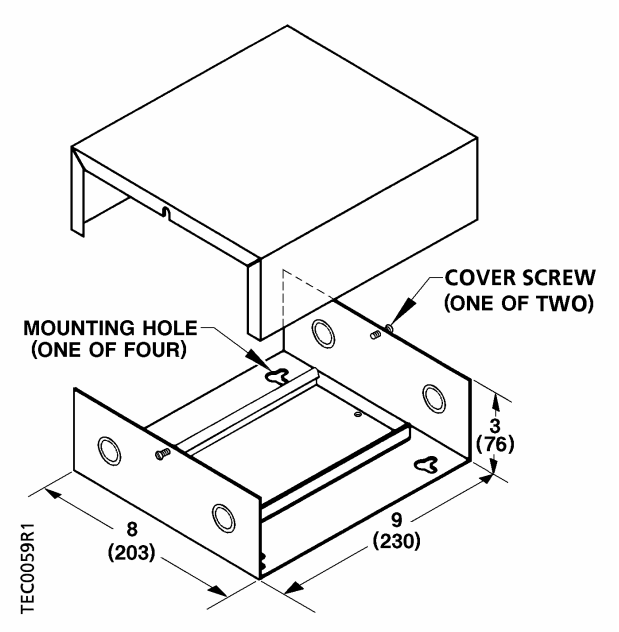
2. Remove appropriate knockouts.
3. Align the enclosure on the mounting surface and mark the position of the mounting holes (Figure 1 or Figure 2).
4. Mount the enclosure with the self-tapping screws provided or drill pilot holes and mount with other screws.
5. Do one of the following:

   - If the controller will not be installed at this time, replace the cover.
   - If the controller will be installed now, then snap it into the mounting rail and replace enclosure cover. (For enclosure 550-002, see Figure 4 for how to secure the mounting rail, and Figure 6 for how to replace the cover.)

The enclosure is installed.

Expected Installation Time

20 minutes



Dimensions in Inches (Millimeters)

Figure 1. Enclosure 540-155.

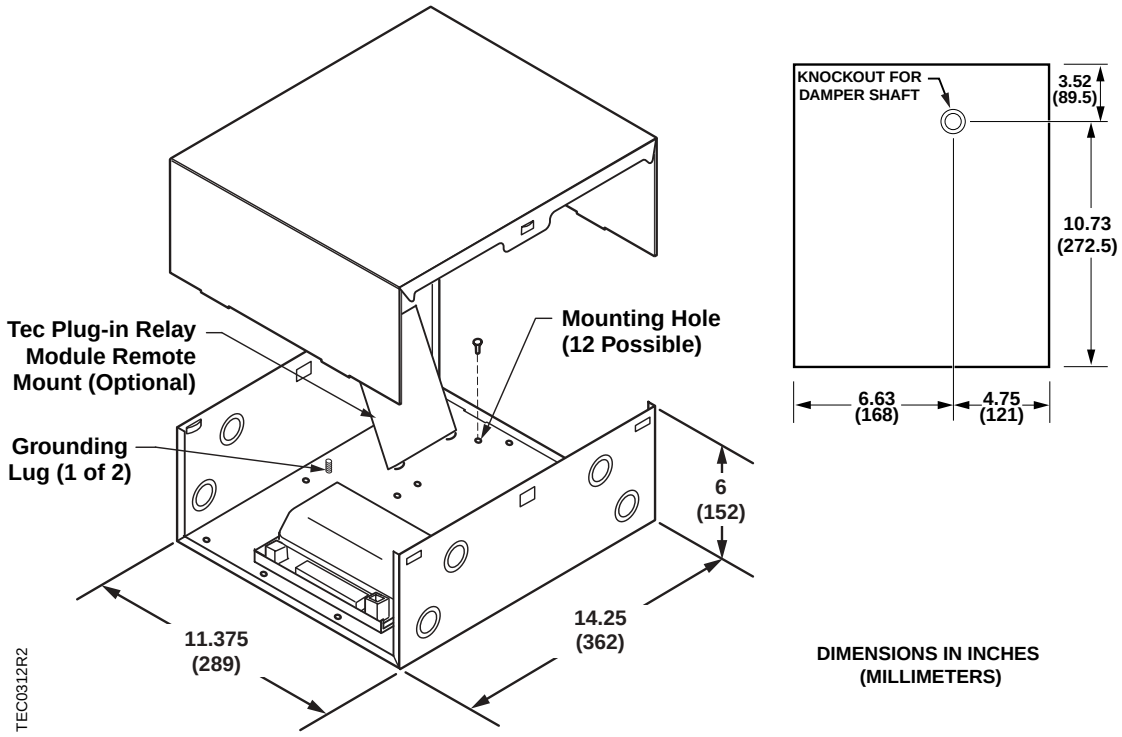
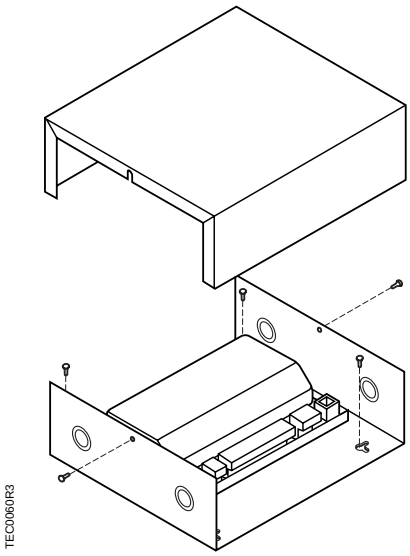
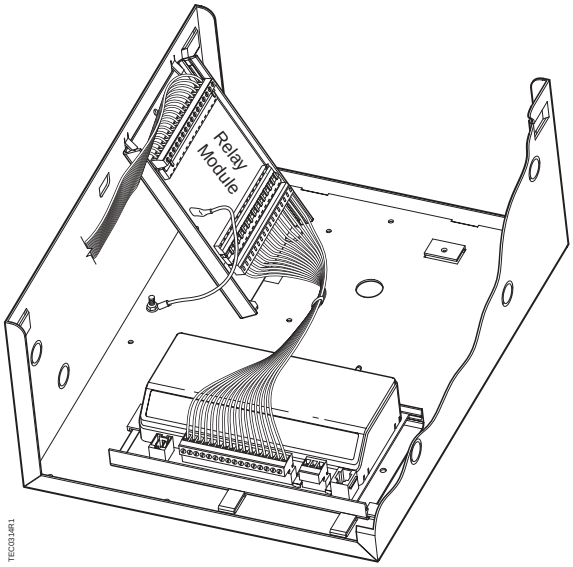


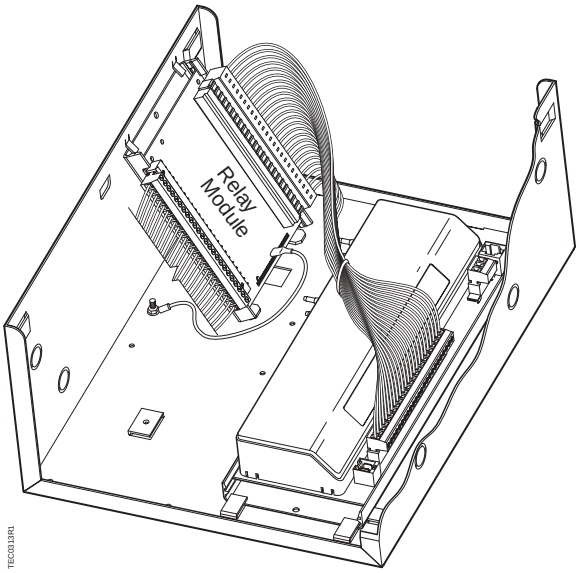
Figure 2. Enclosure 550-002.



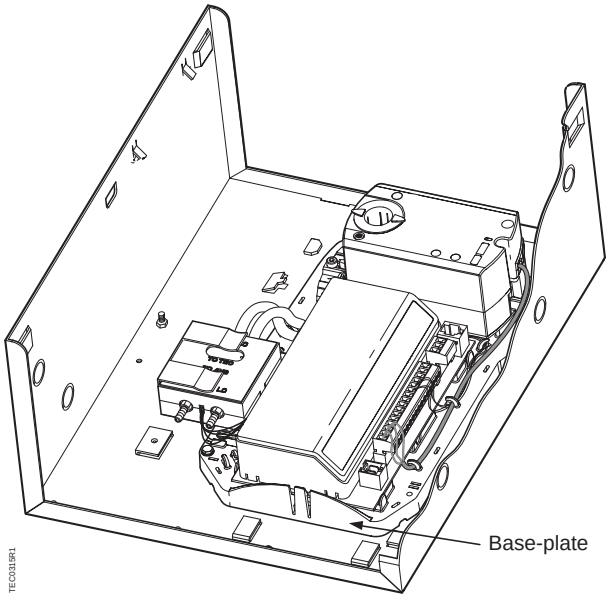
Enclosure 540-155 with Short Platform Controller



Enclosure 550-002 with Short Platform Controller and optional TEC Plug-in Relay Module (remotely mounted)



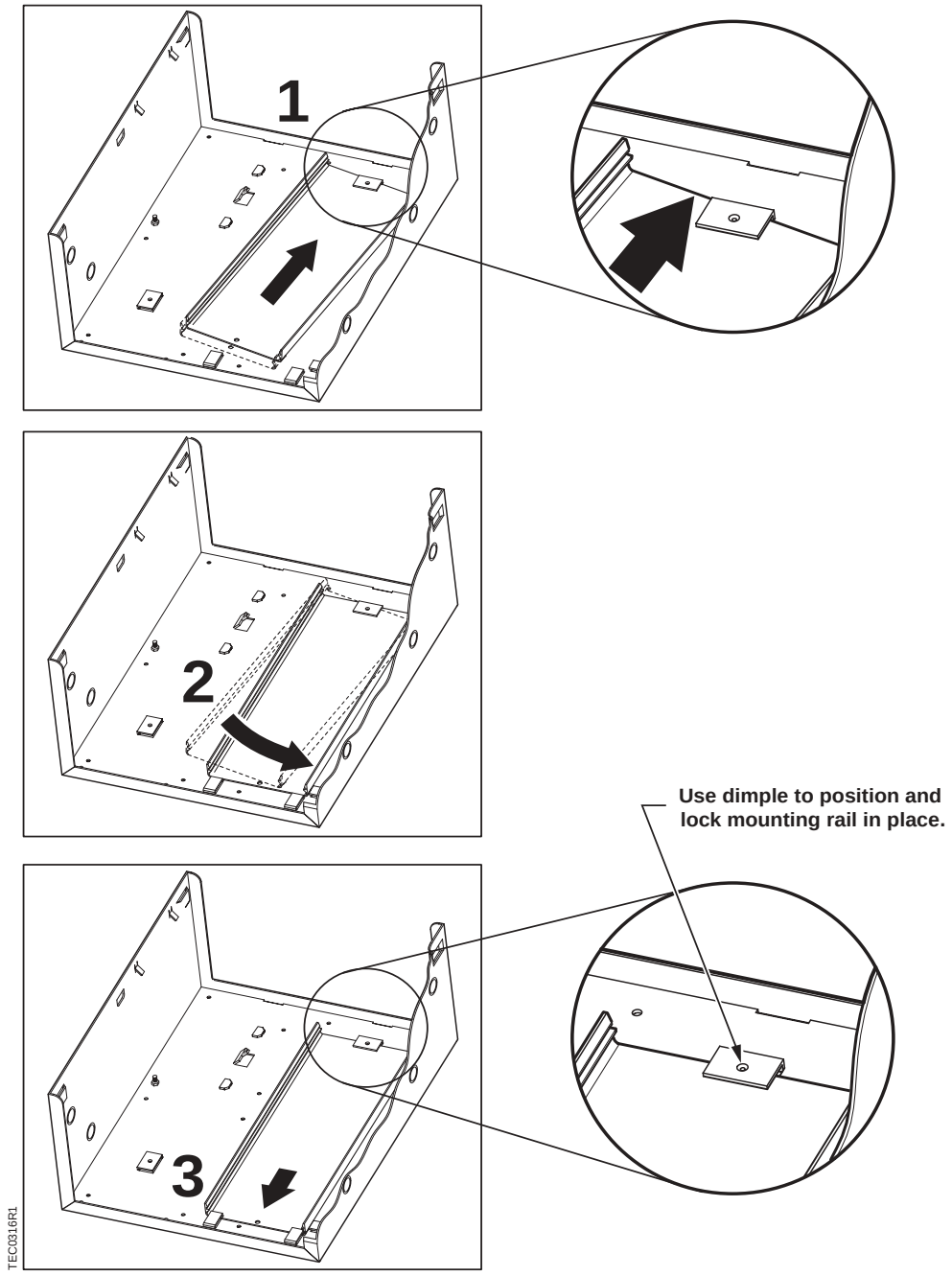
Enclosure 550-002 with Long Platform Controller and optional TEC Plug-in Relay Module (remotely mounted)



Note: TEC Plug-in Relay Module (optional) is not shown but is available with this configuration.

Enclosure 550-002 with TEC Actuator Package (shown with optional Autozero Module)

Figure 3. Enclosures with Controllers and Optional Components Installed.



With enclosure 550-002, the mounting rail does not mount with screws. Instead, it slides under and is secured by mounting flanges. **Exception:** TEC Actuator Package (P/N comes pre-assembled on a common base-plate that must be screwed in place.
Short platform mounting rail mounts in same manner as long platform mounting rail, but at right angle.

Figure 4. Enclosure 550-002, Method of Securing Mounting Rails.

NOTE: Long platform mounting rail shown above. Short platform mounting rail mounts in same manner but at right angle.

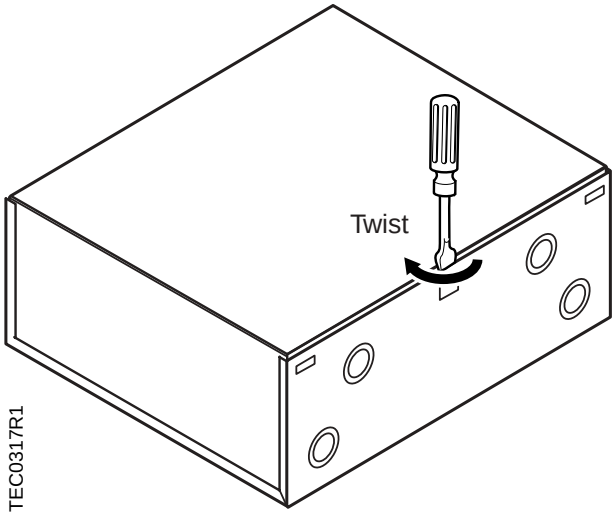


Figure 5. Enclosure 550-002 — First Step of Removing Cover (do both sides).

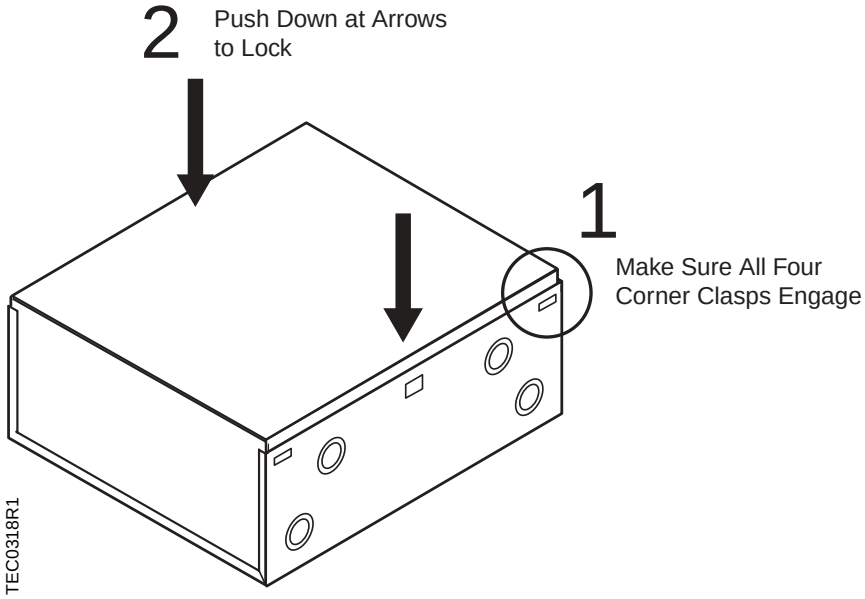


Figure 6. Enclosure 550-002 — Replacing Cover.

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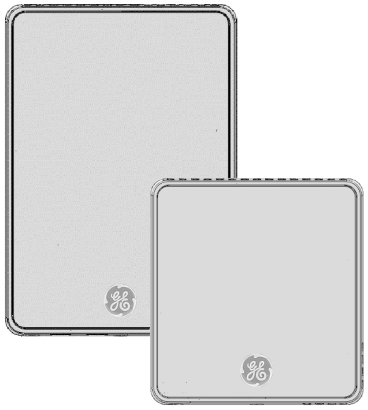
GE
Measurement & Control

Telaire Ventostat™ 8000 Series
CO_2 Sensor
User Instructions

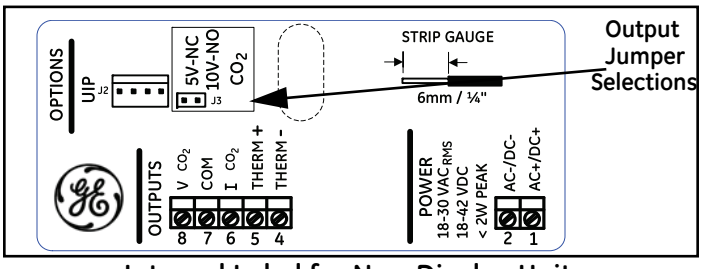
Installing the Sensor

!WARNING!
Before performing service or maintenance operations on the systems, turn OFF main power switches to the unit. Electric shock can cause personal injury. Please read and follow the wiring instructions precisely; miswiring may cause permanent damage to the product.

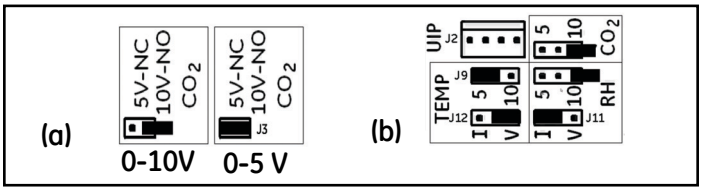


Basic Installation for Non-Display Units

1. Separate the case into its front and rear sections.
2. Secure the rear section of the case to the wall or junction box using the supplied screws, and make necessary wire connections.
3. Mount the Controller on the base by aligning the top clips and then securing to the bottom clips. Secure the Ventostat with the supplied set screw. A one-minute stabilization warmup will take place.

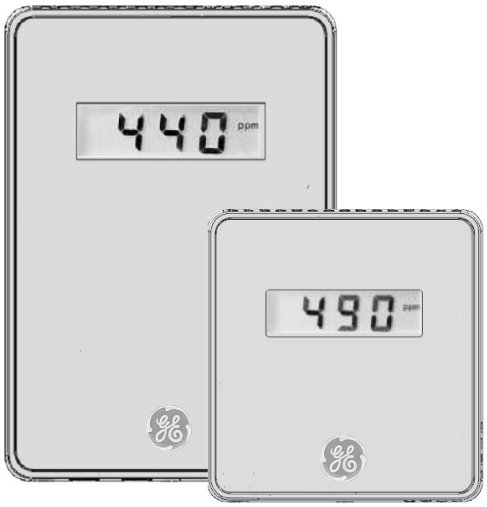


Internal Label for Non-Display Units



Jumper Settings for Non-Display (a) and Display (b) Units

Note: *Example b shows outputs of CO_2 — 4-20 mA and CO_2 — 0-10 V, humidity— 4-20 mA, and active temperature — 0-5 V.*



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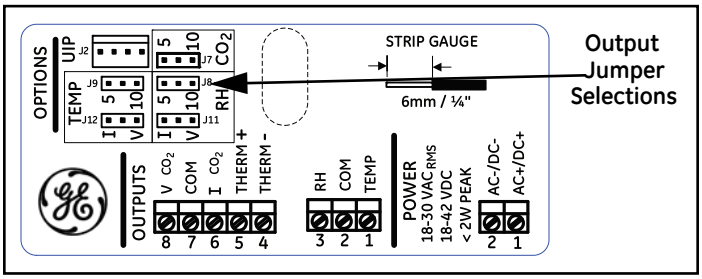
Goleta, CA 93117
www.ge-mcs.com

Basic Installation for Display Units

1. Separate the case into its front and rear sections.
2. Secure the rear section of the case to the wall or junction box using the supplied screws, and make necessary wire connections.
3. Mount the Controller on the base by aligning the top clips and then securing to the bottom clips. Secure the Ventostat with the supplied set screw. A one-minute stabilization warmup will take place.
4. When fitting the T8300 (pitot tube version), complete the installation by screwing the tube connectors to the input ports on the sensor. The tubing connectors can be attached to either input port. It will not affect the performance of the sensor. (See page 3 for further instructions.)



Internal Label for Display Units

Ventostat Wiring Diagrams

The Ventostat family of products has two basic configurations. One configuration provides three active outputs (CO_2, RH and temperature) and an independent thermistor. It has an output terminal block with pins #1, 2 and 3. The other configuration provides only CO_2 outputs and an independent thermistor and has no terminal block with pins 1, 2, and 3 installed. For electrical wiring and power supply requirements, these two configurations are identical; please follow the specific instructions for wiring. The recommended wire gauge is 18-22 AWG (1.0 to 0.75 metric).

!WARNING!

Ventostat products have three terminal pins that are connected inside the sensor to a common/ground: pin #2, 5 and 7 on the I/O terminal blocks and pin #2 on the power block. Do NOT connect positive (hot) 24 VAC power line to terminal number 2 of the terminal block.

Caution!

The T8100 Ventostats are either 3-wire or 4-wire type configurations, powered by either AC or DC voltage. They are not 2-wire or loop-powered devices. Wiring the units as 2-wire or loop-powered devices will irreparably damage the sensors and void the warranty.

Note: *For temperature measurements, Ventostat models contain a passive thermistor (terminal pins #4 and 5), which is electrically isolated from the other circuitry and should be wired independently from active CO2/RH/temperature outputs. The thermistor has no connection to the Ventostat common ground and/or power.*
The active temperature output has the same common (ground) as CO_2 and RH outputs.

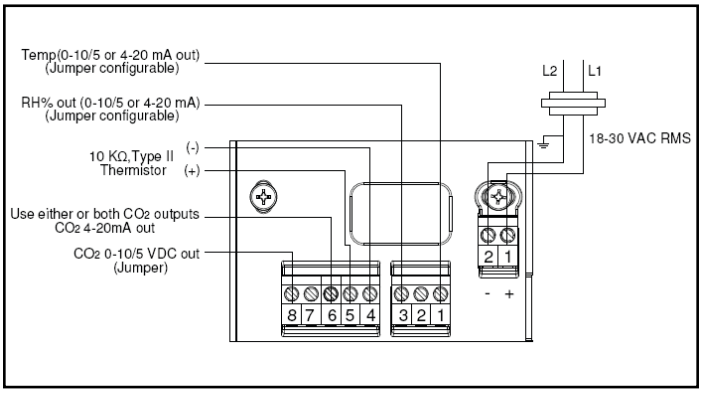


Figure 1: Display Unit Wiring for 3-Wire System, AC Power

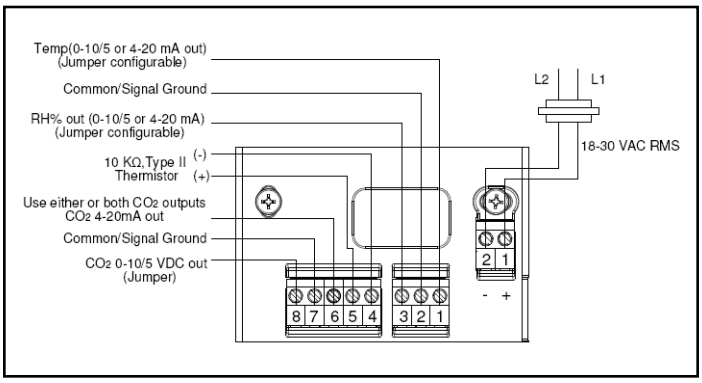


Figure 2: Display Unit Wiring for 4-Wire System, AC Power

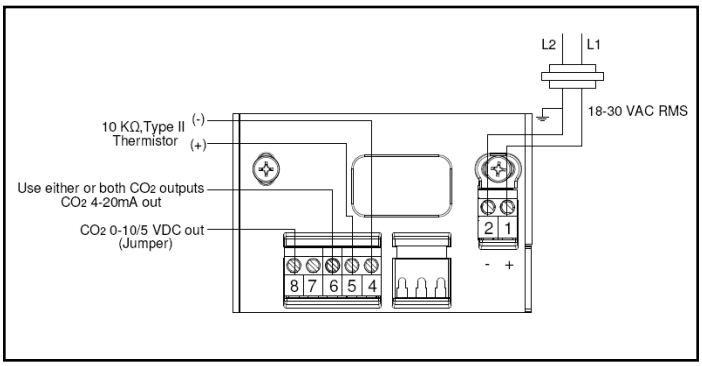


Figure 3: Non-Display Unit Wiring for 3-Wire System, AC Power

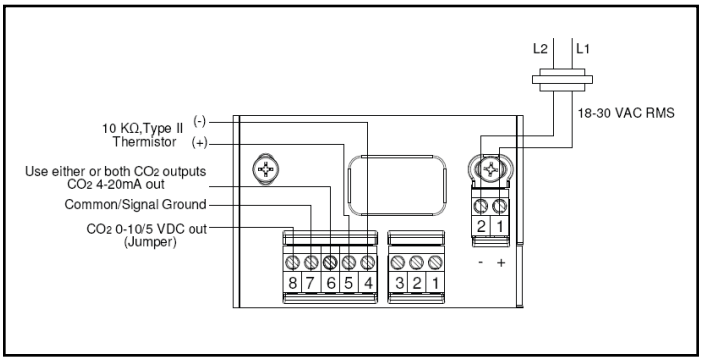


Figure 4: Non-Display Unit Wiring for 4-Wire System, AC Power

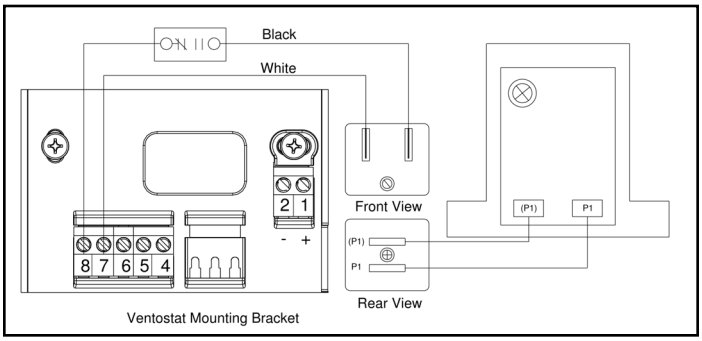


Figure 5: Wiring CO_2 Sensor Voltage Output to Honeywell M7415 Damper Actuator with W7459 Logic Module

Sensing Duct CO_2 Concentrations

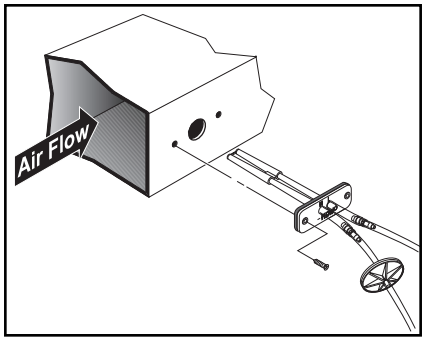
Duct-Mounting the Enclosures

Ventostat products can be installed inside the return air ductwork, if needed. As an alternative, please consider the T8031 unit. When mounting these products inside the ductwork, seal the hole around the wires and leave the duct insulation in place to prevent condensation which may damage the sensor.

Pitot Tube Installation for T8300 and T8300-D

Install the mounting bracket, then install the pitot tube assembly as follows:

Note: *The length of the Tygon® tubing is 6 ft. (1.8 m) with the optional T62892 pitot kit for the T8300. In order to maintain optimum accuracy, the tubing should not be lengthened. If the sensor is mounted closer than 3 ft. (0.9 m) the excess tubing should be shortened to avoid interference with mechanical or moving devices.*



1. To mount the pitot tube, drill one 7/8" hole through the duct.
2. Insert the pitot tube and mark the two remaining holes for the mounting screws.
3. Punch or drill the two marked holes.
4. Note the direction of airflow in the duct.
5. Note the marking on the pitot tube flange and insert so that it is properly aligned with the airflow.
6. To ensure an air tight seal, make sure the mounting surface of the duct is clear of dirt or obstructions. Then, attach the pitot tube to the duct with sheet metal screws or rivets.
7. Check the length of the tubing before attaching to the sensor. The tubing should connect without stretching or pulling. If the length is long enough to create a loop or bind in the tubing, it should be shortened.
8. To shorten the tubing, remove the connectors that attach to the sensor and cut the tubing to length.
9. Replace the tubing connectors by using a twisting or screwing motion. Verify the connection is secure.

Note: *If the tubing length has been shortened, be sure the in-line filter is replaced on the pitot tube connector marked with an "H".*

Accessory Enclosures

Model T1508 Duct Mount Enclosure (Aspiration Box)

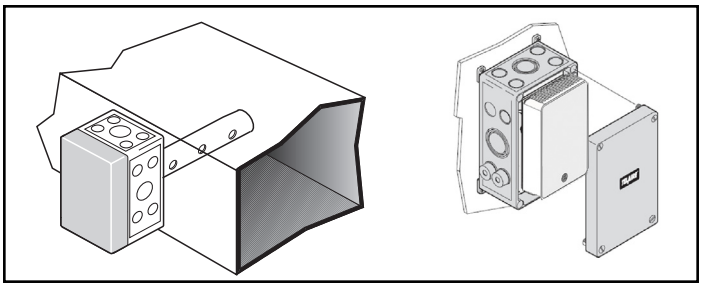
The T8100/T8200/T8300 units can be installed inside a Model 1508 Duct Mount Enclosure.

Model T1552 Outside Air Measurement Enclosure

This NEMA-3R weatherproof enclosure includes thermostat and allows installing the sensor in environments with temperatures down to -40°F.

Model T1505 Harsh Environment Enclosure

For extreme environments where the sensor might be subjected to condensation or water spray such as those found in greenhouses or breweries- NEMA-3R rated.



Ventostat Specifications

Sensing Method

Non-dispersive infrared (NDIR) absorption
Gold-plated optics
Patented ABC Logic self calibration algorithm

CO_2 Measurement Range

T8100/T8200/T8300
0 to 2000 ppm (0 ppm = 0 V, 4 mA; 2000 ppm = 10/5V, 20 mA)

T8100/T8200/T8300 - 5P models
0 to 5000 ppm (0 ppm = 0 V, 4 mA; 5000 ppm = 10/5V, 20 mA)

CO_2 Accuracy

T8100/T8300 - Single Channel
400-1250 ppm ±30 ppm or 3% of reading, whichever is greater*,**
1250-5000 ppm ±5% of reading + 30ppm *, **

T8200 - Dual Channel
75 ppm or 10% of reading (whichever is greater)

*Tolerance based on span gas of ±2%
** ABC Logic not deactivated

Power Supply Requirements

18-30 VAC RMS, 50/60 Hz, or 18 to 42 VDC, polarity protected

Power Consumption

Typical 0.7 W at nominal voltage of 24V AC RMS

Temperature Dependence

0.2% FS per °C (±0.11% per °F)

Stability

T8100/T8300 - Single Channel
<2% of FS over life of sensor (15 years)

T8200 - Dual Channel
<5% of FS or <10% reading annual over life of sensor (10 years)

Pressure Dependence

0.135% of reading per mm Hg

Certifications

CE and RoHS compliant

Signal Update

Every 5 seconds

CO_2 Warm-up Time

< 2 minutes (operational)
10 minutes (maximum accuracy)

Operating Conditions

32°F to 122°F (0°C to 50°C)
0 to 95% RH, non-condensing

Storage Conditions

-40°F to 158°F (-40°C to 70°C)

Flammability Classification

UL94 5VA

Thermistor Type

NTC 10 KΩ thermistor

Thermistor Accuracy

±1°C (15° to 35°C)

RH Sensing Element

Capacitive polymer sensor

RH Range

0% to 99% RH (non-condensing)

RH Accuracy (25°C)

±2.5% RH (20 to 80% RH)
±3.5% RH (<20% and >80% RH)

Active Temperature Accuracy

±0.8°C @ 22°C

Active Temperature Range

0 to 50°C

ABC Logic™ Self Calibration System

ABC Logic™ (Automatic Background Calibration) self calibration allows the sensor to continually recalibrate itself when the indoor concentrations drop to outside levels while the building is unoccupied. Generally a building must be regularly unoccupied for 4 hours or more for this self-calibration system to operate properly. Under these conditions, ABC Logic™ should maintain sensor calibration over the lifetime of the sensor. The ABC Logic™ should be turned OFF where a building is continuously occupied 24 hours per day, or where there could be significant sources of non-occupant related CO_2 such as greenhouses, breweries and other industrial and food processing applications.

Output

Analog
0 to 5 V, (100 Ω output impedance)
0 to 10 V (100 Ω output impedance) and
4 to 20mA (R_L maximum 500 Ω) available simultaneously for CO_2 output
Digital to analog error ±1%

Warranty/Other

Warranty

18 months parts and labor

This product is covered by one or more of the following patents: 5,650,624 / 5,721,430 / 5,444,249 / 5,747,808 / 5,834,777 / 5,163,332 / 5,340,986 / 5,502,308 / 6,344,798 / 6,023,069 / 5,370,114 / 5,601,079 / 5,691,704 / 5,767,776 / 5,966,077 / 6,107,925 / 5,798,700 / 5,945,924 / 5,592,147 / 6,255,653 / 6,250,133 / 6,285,290

Warranty Repairs

GE Sensing will repair Telaire product that fails to meet the terms provided for in the Return and Warranty Policy Statement (See, http://www.ge-mcs.com/en/services-and-support.html).Warranty period shall start from date of manufacture and be based on product category and type of equipment as specified in Table 1: Product Warranty Periods. For all warranty repairs, GE Sensing will bear all product repair parts, labor, and standard ground shipping charges.

SIEMENS

Technical Instructions
Document No. 155-052P25
SW 141-1
June 17, 2010

Powers™ Controls

SW 141 Differential Static Airflow Switches

141-0518

Description

The SW 141 Airflow Switch senses static differential pressure and the diaphragm operated snap switches actuate electrical circuits. Auto reset and manual reset models are available.

Application

Auto reset switches (141-0518 and 141-0574) should be used for applications requiring positive proof of airflow (or fan operation) or to detect high differential pressures associated with dirty air filters or similar maintenance alarms not requiring safety lock-out (shut down) of the fan.

The manual reset switch (141-0575) should be used for applications requiring safety lock out (shut down) of the fan. The switch can be used on the fan discharge (positive pressure), fan inlet (negative pressure), or across the fan (differential pressure) to detect excessively high positive pressures or low negative pressures, and turn off the fan before damage occurs to ducts or dampers.

Product Numbers

Table 1.

Product Number	Setpoint Range (Field Adjustable)	Setpoint * Accuracy	Switching * Differential	Switching Action
141-0518	1” to 12” WC (250 Pa to 3000 Pa)	@ 12” ± 1.5” WC (3000 Pa ± **375** Pa)	Approx. 0.6” to 1.5” WC **(150 Pa to 375 Pa)**	SPDT/ Auto Reset
141-0575	1” to 12” WC (250 Pa to 3000 Pa)	@ 12” ± 1.5” WC (3000 Pa ± **375** Pa)	Not Applicable	SPST/ Manual Reset
141-0574	0.05” to 1.0” WC (12.5 Pa to 250 Pa)	@ 1”±0.2“ WC (250 Pa ± 50 Pa)	Approx. 0.06**"** to 0.6” WC **(15 Pa to 150 Pa)**	SPDT/ Auto Reset

***** Setpoint accuracy **tolerance** and switching differential decrease proportional to setpoint decrease.

Specifications

	Measured media	Air
	Switch action	
Operating	Auto reset Manual reset	See Table 1 Switch is Normally Closed (N.C.) and only opens on increasing pressure signal. Switch must be manually reset by operator
	Ambient temperature range	–40°F to 180°F (–40°C to 82°C)
	Maximum overpressure	0.5 psi (3.4 kPa)
	Mounting position	Diaphragm in any vertical plane
Physical	Electrical ratings	Non inductive - 15 amps @ 120-277 Vac Pilot Duty - 300 VA @ 120-277 Vac
	Conduit opening	One, conduit size 1/2-inch
	Sample line connectors	Two connectors, complete with nuts and ferrules, which accept 1/4-inch OD (6.4 mm) copper or poly tubing
	Material	Aluminized steel
	Agency certification	
	U.L. CSA	MFHX File MH9888 1811M25
	Weight	1 lb (0.45 kg)
	Dimensions	See Figure 9

Accessories

High accuracy static pressure sensor	269-062
Static pressure sensing kit	189-142

Operation

The diaphragm operates a spring lever to actuate the snap switch. The manual reset switch keeps the electrical contact open until pushed to reset. Turning the adjustment knob clockwise increases the setpoint.

Installation

Mount the unit with the diaphragm in any vertical plane. Connect the static pressure line(s) as shown in Figure 1.

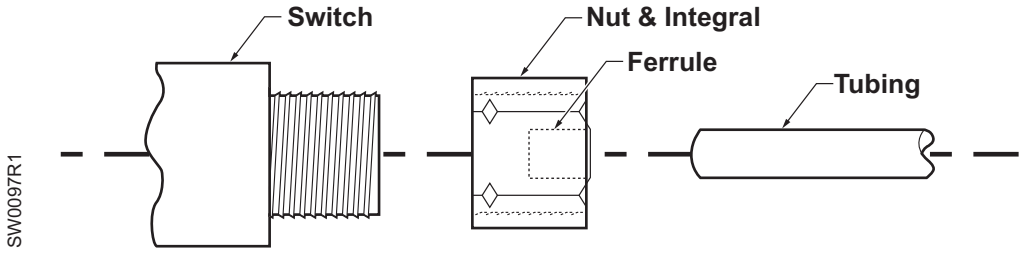


Figure 1. Connecting the Static Pressure Line.

Installation, Continued

For use as a negative pressure switch:

Connect the static pressure line to the low inlet (marked on the case and Figure 2) and leave the high inlet open to the atmosphere.

For use as a positive pressure switch:

Connect the static pressure line to the high inlet (marked on the case and Figure 2) and leave the low inlet open to the atmosphere.

For use as a differential pressure switch:

Connect the highest static pressure line to the high inlet and the lowest static pressure line to the low inlet (marked on the case and Figure 2.)

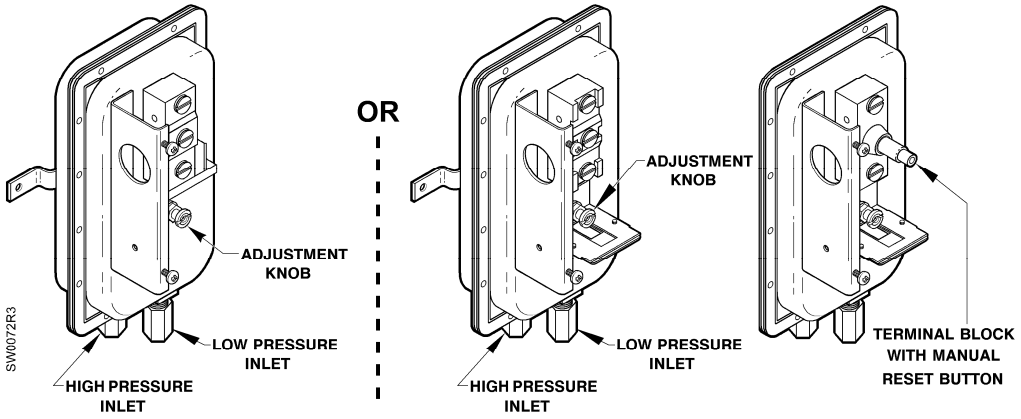


Figure 2. Switches with Covers Removed.

Setpoint Adjustment

Each switch is factory set at the minimum setpoint. See Table 1.

1. To increase the setpoint, turn the adjustment screw clockwise as shown in Figure 2 and Figure 3. From the lowest setpoint, several turns are necessary to engage the adjusting mechanism.

2. Adjust the setpoint until switching occurs at the required point.

3. Check the setpoint for accuracy with a magnahelic gauge.

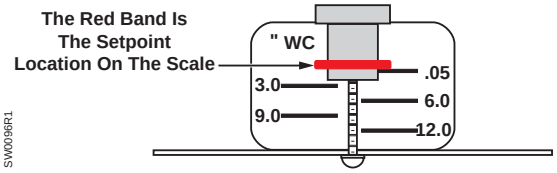


Figure 3. Adjusting the Setpoint.

Pressure Sensors

Pressure sensor selection is based on the medium to be measured, the measurement type (static or velocity), and the required range and accuracy.

Pressure sensors measure the difference between two sensing ports usually labeled high and low. This provides a pressure measurement against a reference. Measuring the pressure inside a pipe or duct and comparing it to the air outside (ambient) the pipe or duct is an example of static pressure measurement. A sensor measuring the pressure differential across a pump or chiller measures velocity pressure.

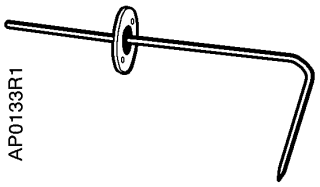


Figure 4. Pitot Tube (Part Number 269-062).

Wiring Diagrams

Before setpoint pressure is applied to the diaphragm, the switch contact is in a normally closed position as shown in Figures 5 and 6.

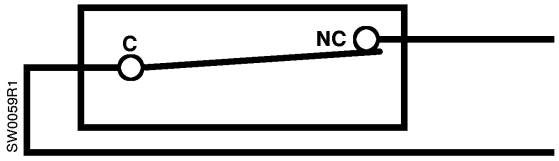


Figure 5. Manual Reset Switch 141-0575.

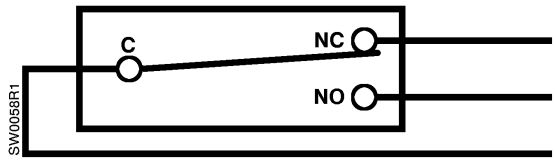


Figure 6. Auto Reset Switches 141-0518 and 141-0574.

SPDT terminals are marked Common (C), Normally Open (NO), and Normally Closed (NC).

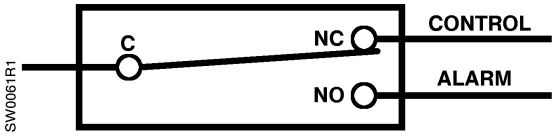


Figure 7. Auto Reset Switches to Prove Excessive Airflow or Pressure.

Wiring Diagrams, Continued

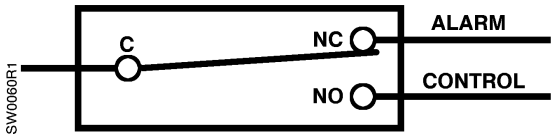


Figure 8. Auto Reset Switches to Prove Insufficient Airflow or Pressure.

Dimensions

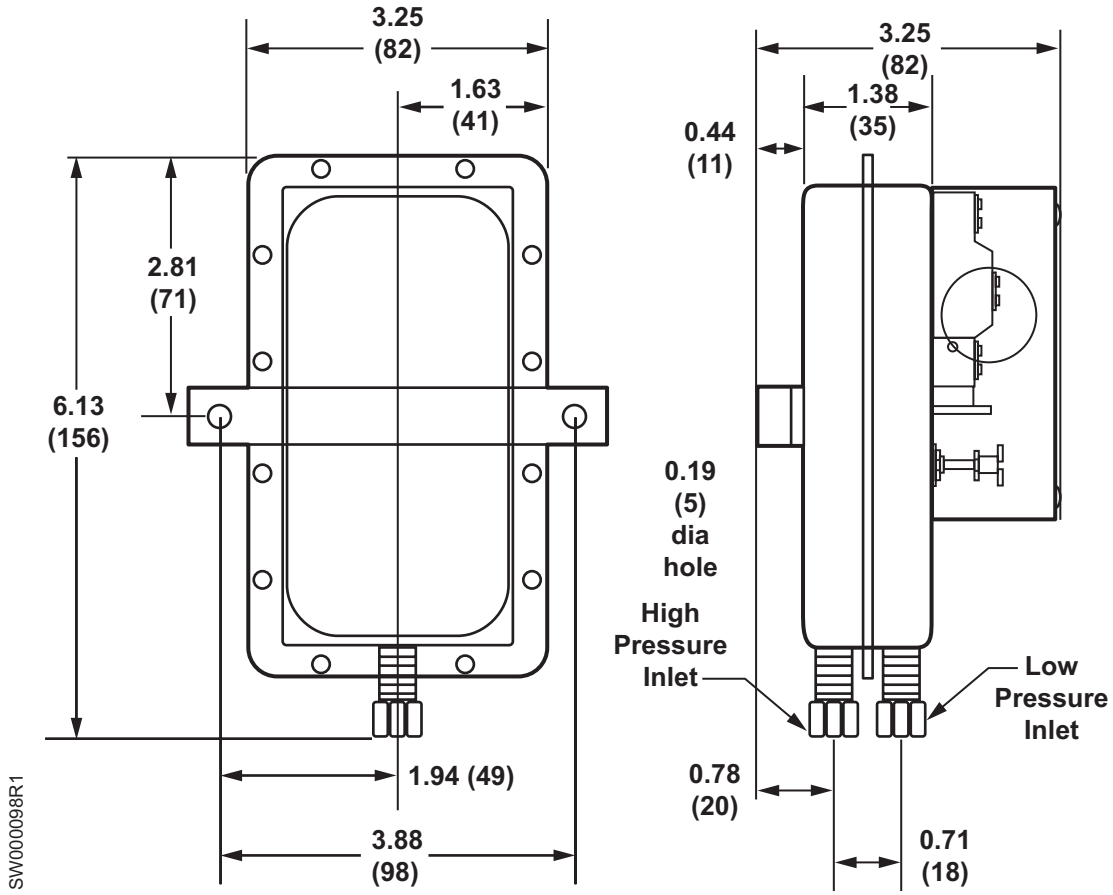


Figure 9. Dimensions in Inches (Millimeters).

Information in this publication is based on current specifications. The company reserves the right to make changes in specifications and models as design improvements are introduced. Powers is a registered trademark of Siemens Industry, Inc. Other product or company names mentioned herein may be the trademarks of their respective owners. © 2010 Siemens Industry, Inc.

Ameritrol Inc.

Manufacturer of Industrial Instrumentation

ELECTRONIC FLOW SWITCHES

Features

- No Moving Parts
- Operates in Liquids, Gases and Slurries
- Can Detect Increase or Decrease of Flow
- 316L Stainless Steel Sensor
- Low Cost, Designed for Industrial OEM and End Users

Applications

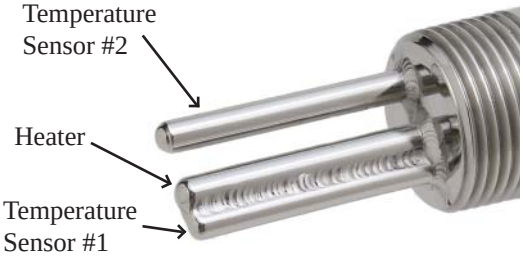
- Low Flow Shut Down of Pumps
- Flow Indication/Verification
- Pump or Valve Seal Leakage
- Bearing Lubrication Flow Sensor
- HVAC Flow Monitor
- Safety Shower Flow Switch

FM Series

The FM series is designed to provide an extremely reliable flow switch at a very cost effective price. This series replaces the standard explosion proof enclosure utilized in our FX series with a general purpose enclosure.

The principle of operation measures a temperature differential between a heated and a reference temperature sensor (see figure 1). The differential varies as flow across the sensor changes. This allows the flow switch to detect the increase or decrease of flow of virtually all liquids, gases and slurries. Flow ranges are shown on the next page of this brochure in the set-point range chart. A conversion chart is also provided to covert volumetric flow to velocity.

The electronics feature a SPDT relay switch output with options for power input of 120 VAC, 12VDC, and 24 VDC or VAC. Calibration is easily performed by adjusting a potentiometer on the circuit board.



Temperature Differential = Temperature Sensor #1 Minus Temperature Sensor #2

Part Number/Order Entry Specification

FM - [ ][ ][ ][ ][ ] - [ ][ ][ ]

Option

S	HIGH FLOW OPTION- CLEAN LIQUIDS/GASES, 1" MNPT ONLY

Process Connection

½" MNPT	0	5	0	0
¾" MNPT	0	7	5	0
1" MNPT	1	0	0	0

Probe Length

0	1	1.2" PROBE
0	2	1.8" PROBE
		SPECIAL PROBE LENGTH, SPECIFY LENGTH IN INCHES

Power Input

12 VDC (+30%, -10%)	B
117 VAC (90-135 VAC)	C
24 VDC or VAC (± 10%)	D

Optional Calibrator

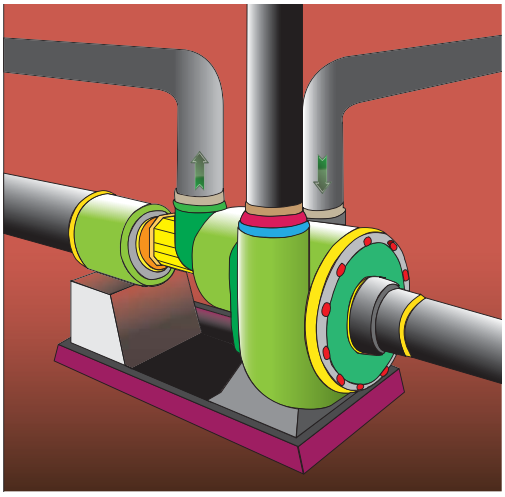
Flow Switch Calibrator Model MC-5

- Displays mV output which is proportional to flow
- Induces signal to electronics for setting specified switch point
- Allows periodic switch point verification

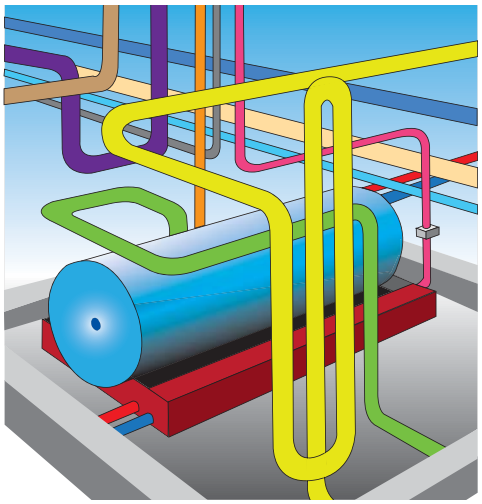
This tool is not needed for a vast majority of users. It is useful when a user has large quantity of units and requires periodic verification of switch point calibrations.

This easy to use hand held, self powered instrument can be used in conjunction with all single or dual switch point circuit boards. By simply plugging this instrument into the circuit board, the user can interrogate all functions of the flow switch.

Flow Switch Applications

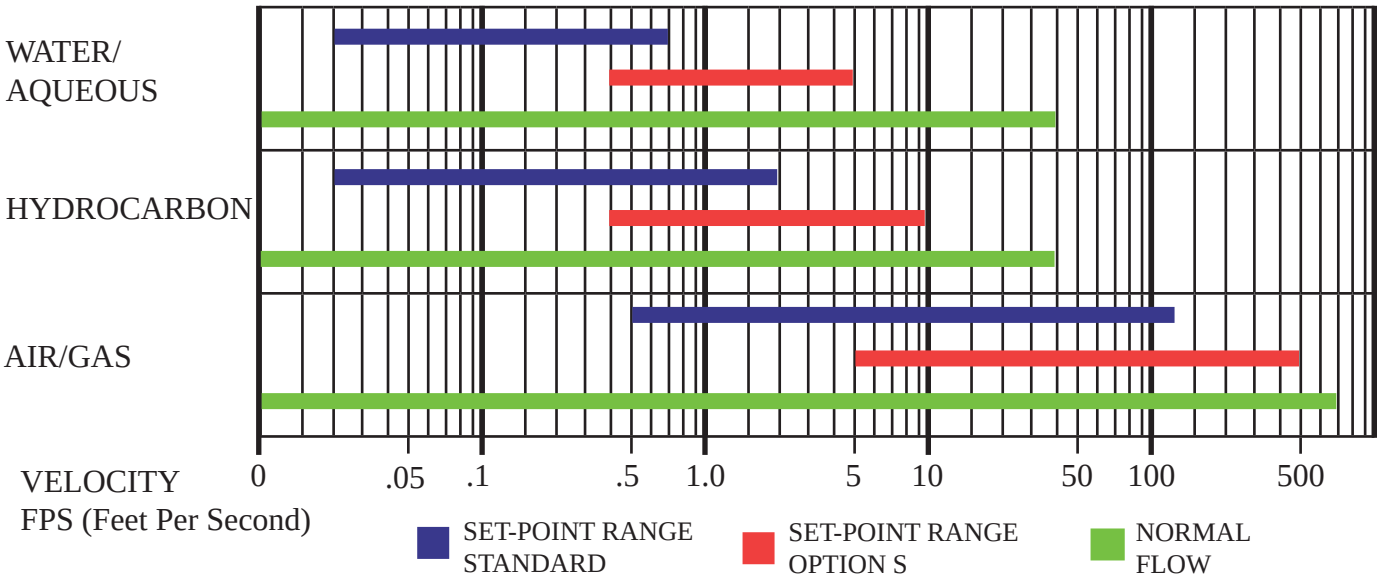


- Pump Protection: Automatic shut down on low or no flow
- Bearing Lubrication: Detects loss of lubricant flow
- Seal Leakage: Verifies positive seal flow or detects excessive leakage indicating maintenance requirement
- Chemical Feed and Metering Pumps: Indicates low or no flow of chemical additives to process
- Safety Shower/Eye Wash Station: Automatic annunciation of potential danger to plant personnel
- Analyzer/ Gas Chromatographs: Confirms continuous sample flow to instruments
- Control Rooms: Verifies flow when fans, pumps or valves are energized



- Purge Air: Detects loss of flow for process or plant safety
- Spray Nozzles: Detects nozzle blockage in coating applications
- Relief Valve/Rupture Disks: Alarms on flow or leakage of safety relief valves or rupture disks
- Chiller Lines: Automatic shut down of chillers on low or no flow
- Heater Burnout Prevention: Heater shutdown on loss of flow to prevent overheating of elements
- Tank Car Loading: Senses dry line or phase change from liquid to nitrogen gas flow
- Drain Line Sensor: Capable of detecting flow in partially filled lines
- Agitation Monitor: Positive indication of agitation in tanks

Flow Switch Set-Point Range



Conversion Table

Volumetric (GPM or CFM) to Velocity (Feet per Second - FPS)

Line Size	1/8”	1/4”	3/8”	1/2”	3/4”	1”	1.25”	1.5”	2”	2.5”	3”	3.5”	4”	5”	6”
Liquid Multiplier	5.65	3.08	1.68	1.06	.602	.371	.215	.158	.096	.067	.0434	.0325	.0252	.0160	.0111
Air Multiplier	42.19	23.06	12.57	7.91	4.50	2.78	1.61	1.18	.716	.502	.325	.243	.188	.120	.083

Line Size	8”	10”	12”	14”	16”	18”	20”	24”
Liquid Multiplier	.0064	.00407	.00287	.00237	.00182	.00143	.00115	.000798
Air Multiplier	.0480	.0304	.0209	.0177	.0136	.0107	.00863	.00597

Examples:

1) 100 CFM in 3” Line = 100 x .325 = 32.5 FPS

2) 10 GPM in 3” Line = 10 x .0434 = .434 FPS

Specifications

Sensor Head

Material of Construction: 316L Stainless Steel Standard

Operating Temperature: -50 to +250F (-46 to +121C)

Operating Pressure: Vacuum to 4000 PSIG (275 Bar)

Response Time: From 3 Seconds

Repeatability ± 0.5% of Range at Constant Conditions

Process Connection: ¾” MNPT, 1” MNPT , Option ½”MNPT

Probe Length: 1.8”, 1.2” Option Customer Specified

Electronics

Housing: Powder Coated General Purpose

Temperature: -50 to +150F (-46 to +65C)

Power Input: 90-135 VAC, 50/60 Hz, 4 Watts
Option 12 VDC, 24 VDC/VAC

Relay Output: SPDT 2 Amps Resistive

Electrical Connection: 1” FNPT

Shipping Weight: 4 lbs

Ameritrol Inc.

1185L Park Center Drive
Vista CA 92081
760-727-7273 Phone
760-727-7151 Fax

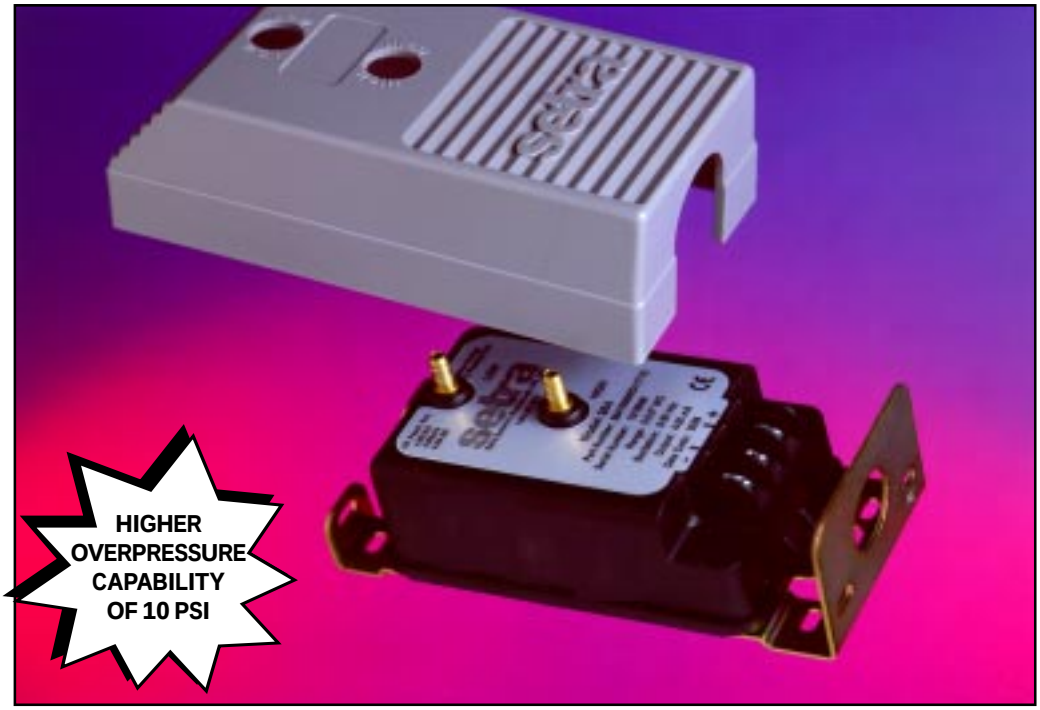
1-800-910-6689

Visit our website at
www.ameritrol.com

Model 264

Very Low Differential Pressure Transducer

Unidirectional Ranges: 0 - 0.1 to 0 - 100 in. W.C.
Bidirectional Ranges: 0 - ±0.1 to 0 - ±50 in. W.C.
Air or Non-Conducting Gas



Setra Systems 264 pressure transducers sense differential or gauge (static) pressure and convert this pressure difference to a proportional electrical output for either unidirectional or bidirectional pressure ranges. The 264 Series is offered with a high level analog 0 to 5 VDC or 4 to 20 mA output.

Used in Building Energy Management Systems, these transducers are capable of measuring pressures and flows with the accuracy necessary for proper building pressurization and air flow control.

The 264 Series transducers are available for air pressure ranges as low as 0.1 in. W.C. full scale to 100 in. W.C. full scale. Static standard accuracy is ±1.0% full scale in normal ambient temperature environments, but higher accuracies are available. The units are temperature compensated to 0.033% FS/°F thermal error over the temperature range of 0°F to +150°F.

Guaranteed 3 Day Shipment for Standard Parts (less than 10 pieces)

3-year Unconditional Warranty

The Model 264 utilizes an improved all stainless steel micro-tig welded sensor. The tensioned stainless steel diaphragm and insulated stainless steel electrode, positioned close to the diaphragm, form a variable capacitor. Positive pressure moves the diaphragm toward the electrode, increasing the capacitance. A decrease in pressure moves the diaphragm away from the electrode, decreasing the capacitance. The change in capacitance is detected and converted to a linear DC electrical signal by Setra's unique electronic circuit.

The tensioned sensor allows up to 10 PSI overpressure (in either direction) with no damage to the unit. In addition, the parts that make up the sensor have thermally matched coefficients, which promote improved temperature performance and excellent long term stability.

When it comes to a product to rely on - choose the Model 264. When it comes to a company to trust - choose Setra, an ESOP (Employee - Owned) company.

NOTE: Setra quality standards are based on ANSI-Z540-1.
The calibration of this product is NIST traceable.

U.S. Patent nos. 4093915; 4358814; 4434203; Other Patents Pending.

Applications

- Heating, Ventilating and Air Conditioning (HVAC)
- Energy Management Systems
- Variable Air Volume and Fan Control (VAV)
- Environmental Pollution Control
- Lab and Fume Hood Control
- Oven Pressurization and Furnace Draft Controls

Benefits

- 10 PSI Overpressure on All Ranges.
- Installation Time Minimized with Snap Track Mounting and Easy- To-Access Pressure Ports and Electrical Connections.
- 0 to 5 VDC or 2-wire 4 to 20 mA Analog Outputs Are Compatible with Energy Management Systems.
- Reverse Wiring Protection.
- Internal Regulation Permits Use with Unregulated DC Power Supplies.

ISO 9001 Certified

Visit Setra Online:
http://www.setra.com

setra

800-257-3872

159 Swanson Rd., Boxborough, MA 01719/Telephone: 978-263-1400/Fax: 978-264-0292

Model 264 Specifications

Performance Data

Accuracy* RSS(at constant temp)	±1.0% FS**	±0.25%
Non-Linearity, BFSL	±0.96% FS	
Hysteresis	0.2% FS	0.20% FS
Non-Repeatability	0.1% FS	0.02% FS

Thermal Effects

Compensated Range °F(°C)	0 to +150 (-18 to +65)
Zero/Span Shift %FS/°F(°C)	0.033 (0.06)
Maximum Line Pressure	10 psi
Overpressure	10 psi in Positive or Negative Direction.

Position Effect (Unit is factory calibrated at 0g effect in the vertical position.)	Range	Zero Offset (%FS/G)
	0 to 0.1 in. WC	2.1
	0 to 1.0 in.WC	.22
	0 to 5 in.WC	.14
	0 to 10 in. WC	.12

* RSS of Non-Linearity, Hysteresis, and Non-Repeatability.

**Note: See ordering information below for optional accuracies.

Specifications subject to change without notice.

Environmental Data

Temperature	
Operating* °F (°C)	0 to +175 (-18 to +79)
Storage °F (°C)	-65 to +250 (-54 to +121)

*Operating temperature limits of the electronics only. Pressure media temperatures may be considerably higher.

Physical Description

Case	Fire-Retardant Glass Filled Polyester
Mounting	Four screw holes on removable zinc plated steel base. Designed for 2.75" snap track.
Electrical Connection	Screw Terminal Strip
Pressure Fittings	3/16" O.D. barbed brass pressure fitting for 1/4" push-on tubing.
Zero and Span Adjustments	Accessible on top of case
Weight (approx.)	10 ounces

Pressure Media

Typically air or similar non-conducting gases.

Electrical Data (Voltage)

Circuit	3-Wire (Com, Exc, Out)
Excitation	9 to 30 VDC
Output*	0 to 5 VDC**
Bidirectional output at zero pressure:	2.5 VDC**
Output Impedance	100 Ohms

*Calibrated into a 50K ohm load, operable into a 5000 ohm load or greater.
**Zero output factory set to within ±50mV.
**Span (Full Scale) output factory set to within ±50mV.

Electrical Data (Current)

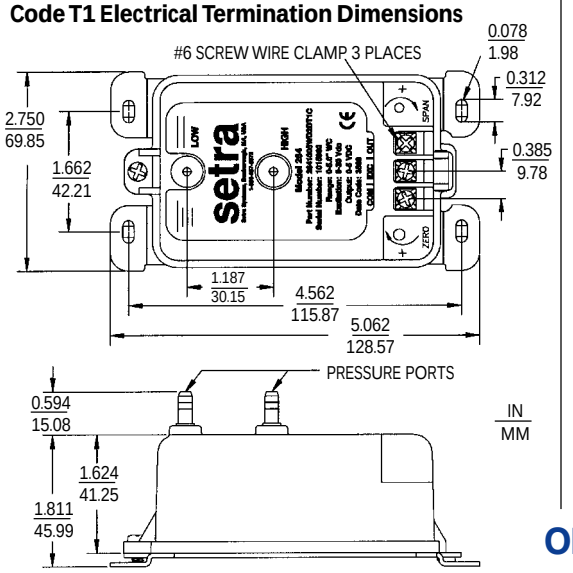
Circuit	2-Wire
Output*	4 to 20mA**
Bidirectional output at zero pressure:	12mA**
External Load	0 to 800 ohms

Minimum supply voltage (VDC) = 9+ 0.02 x (Resistance of receiver plus line).
Maximum supply voltage (VDC) = 30+ 0.004 x (Resistance of receiver plus line).

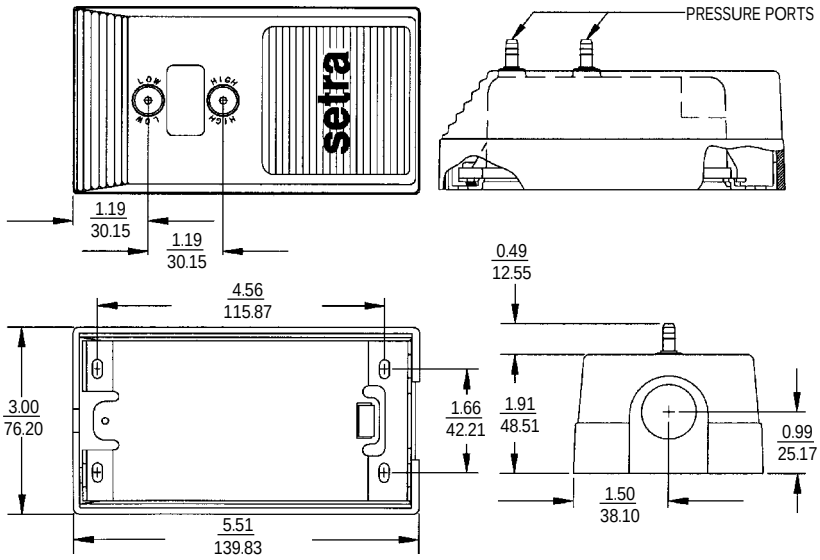
*Calibrated at factory with a 24 VDC loop supply voltage and a 250 ohm load.
**Zero output factory set to within ±0.16mA.
**Span (Full Scale) output factory set to wtihin ±0.16mA.

Outline Drawings

Code T1 Electrical Termination Dimensions



Code A1 Electrical Termination Dimensions



SSP264 Rev.C 11/01/99

ORDERING INFORMATION

Code all blocks in table.

Example: Part No. 26412R5WD11T1C for a 264 Transducer 0 to 2.5 in. WC Range, 4 to 20 mA Output, Terminal Strip Electrical Connection, and ±1% Accuracy.

2 6 4 1 — [ ][ ][ ][ ][ ] — [ ][ ] — [ ][ ] — [ ]

Model
2641 = 264

Ranges

Differential
- **0R1WD** = 0 to 0.1 in. WC
- **R25WD** = 0 to 0.25 in. WC
- **0R5WD** = 0 to 0.5 in. WC
- **001WD** = 0 to 1 in. WC
- **2R5WD** = 0 to 2.5 in. WC
- **003WD** = 0 to 3 in. WC
- **005WD** = 0 to 5 in. WC
- **010WD** = 0 to 10 in. WC
- **015WD** = 0 to 15 in. WC
- **025WD** = 0 to 25 in. WC
- **050WD** = 0 to 50 in. WC
- **100WD** = 0 to 100 in. WC

Bidirectional
- **R05WB** = ±0.05 in. WC
- **0R1WB** = ±0.1 in. WC
- **R25WB** = ±0.25 in. WC
- **0R5WB** = ±0.5 in. WC
- **001WB** = ±1 in. WC
- **1R5WB** = ±1.5 in. WC
- **2R5WB** = ±2.5 in. WC
- **005WB** = ±5 in. WC
- **7R5WB** = ±7.5 in. WC
- **010WB** = ±10 in. WC
- **025WB** = ±25 in. WC
- **050WB** = ±50 in. WC

Output
- **11 =** 4-20 mA
- **2D =** 0 to 5 VDC

Elec. Termination
Standard
- **T1 =** Terminal Strip

Optional
- **A1 =** 1/2" Conduit

Accuracy
Standard
- **C =** ±1% FS

Optional (w/Cal. Cert.)
- **E =** ±0.4% FS
- **F =** ±0.25% FS
- **G =** ±1% FS

Please contact factory for versions not shown.

While we provide application assistance on all Setra products, both personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

159 Swanson Road, Boxborough, MA 01719/Tel: 978-263-1400;
Toll Free: 800-257-3872; Fax: 978-264-0292; email: sales@setra.com

AIR PRESSURE SENSORS, SURGE DAMPENERS

A-300 SERIES, MODELS RPS, #21121, SD-01

DESCRIPTION

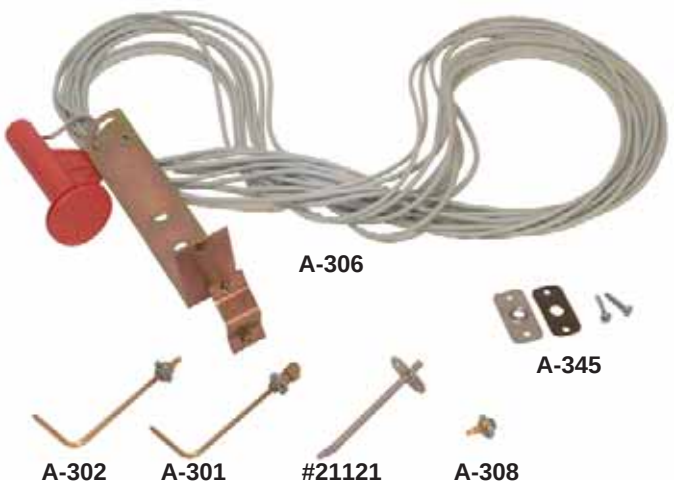
Static Pressure Sensors
A300 Series sensors are used with pressure transmitters and pressure switches to sense duct pressures. Two sensors are required to monitor pressure across coils, filters, blowers, etc. **A-301** and **A-302** have four radial sensing holes and a 4" (10.2 cm) insertion depth. The **A-308** should be used only where accuracy is not critical. All mount in a 3/8" hole in the duct. If the interior of the duct is not accessible, an optional **A-345** flange mounting kit may be used.

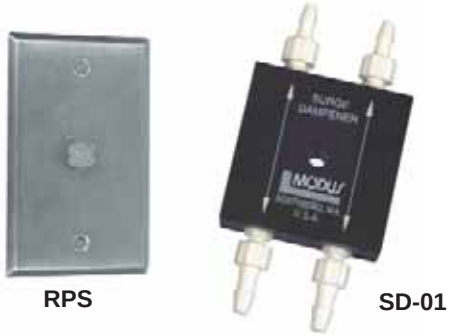
Outdoor Static Pressure Sensor
The **A-306 Outdoor Static Pressure Sensor** provides an outdoor pressure signal for reference in building pressurization applications. The **A-306** includes the sensor, 50' (15.24m) of vinyl tubing, mounting bracket, and hardware.

Room Static Pressure Sensor
The **Model RPS** is a stainless steel, wall-mounted room static pressure sensor. It mounts directly to the wall or to a standard electrical box.

Total Pressure Sensor
The **Model #21121** sensor is used primarily for proving air flow in ducts. The opening in the tip of the 4" (10.2 cm) aluminum tube faces upstream and senses impact (total) pressure.

Surge Dampener
Surge dampeners absorb rapid pressure fluctuations in order to steady a pressure signal. Each surge dampener has two independent channels-one for the low pressure tubing and one for the high pressure tubing. Surge dampeners are typically used with outdoor pressure sensors, which are subject to wind gusts, and isolation rooms, clean rooms, or operating rooms where opening or closing doors creates sudden pressure changes.





ORDERING INFORMATION

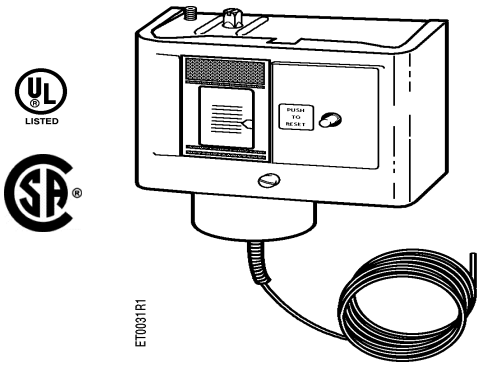
MODEL	DUCT STATIC PRESSURE SENSORS
A-301	Static Pressure Tip, 1/4" Compression
A-302	Static Pressure Tip, 1/4" Barb
A-308	Static Pressure Fitting, 1/4" Barb
A-345	Flange Mounting Kit
	OUTDOOR STATIC PRESSURE SENSOR
A-306	Outdoor Air Static Pressure Kit
	DUCT TOTAL PRESSURE SENSOR
#21121	4" Aluminum Impact Tube for 3/8" OD Plastic Tubing
B-137	1/4" Barb Adapter for #21121 (standard pack-100)
	ROOM STATIC PRESSURE SENSOR
RPS	Stainless Steel Wall-Mount Room Pressure Sensor, 1/4" Barb
	SURGE DAMPENERS
SD-01	Surge Dampener
	FILTER KIT
A-605	Mounting kit for air filter applications

SIEMENS

Technical Instructions
Document No. 155-016P25
ET 134-22
Rev. 1, February, 2000

Powers™ Controls

Low Temperature Detection Thermostat



Description

The electric Low Temperature Detection Cut-out and Alarm Thermostat is a remote bulb instrument which opens an electrical circuit to stop the supply fan motor and/or closes an outside air damper when the temperature at the sensing element falls below the setting of the instrument. Simultaneously, it closes a circuit to indicate an alarm condition.

Features

- Manual reset
- Easy temperature setting with adjusting screw on top of enclosure
- Mounting bracket and two screws included
- Main and separate reverse-acting auxiliary contacts

Product Number

134-1504

Warning/Caution Notations

WARNING	⚠	Personal injury/loss of life may occur if a procedure is not performed as specified.
CAUTION	⚠	Equipment damage, or loss of data may occur if the user does not follow a procedure as specified.

Application

This instrument should only be used on those applications where the ambient temperature to which the instrument case and bellows are exposed remains above the temperature setting of the thermostat. This thermostat should be used in areas protected from the weather.

WARNING:

This low temperature detection thermostat is designed for use only as an operating control. Where an operating control failure would result in personal injury and/or loss of property, it is the installer's responsibility to add devices (safety, limit controls) or systems (alarm, supervisory systems) that protect against, or warn of control failure.

Specifications

Switch Action	Main (LINE-M2) contacts open on temperature drop, simultaneously auxiliary contacts close
Range	15 to 55°F (-9 to 13°C)
Maximum bulb temperature	400°F (204°C)
Minimum differential	5°F (2.8°C) Non-adjustable
Sensing element	Vapor filled
Bulb length	1/8-inch OD x 20 feet (6 m)
Reset action	Manual
Electrical rating	See *Table 1*
Weight	2.4 lbs. (1.1 kg)
Dimensions	See *Figures 2 and 5*
Approvals	UL file SA 3863 CSA file LR948

Operation

This thermostat incorporates a temperature sensing element of the vapor-filled type which actuates a heavy duty contact through a rugged link mechanism.

Any one-foot length of the element subjected to temperatures below the temperature setting of the thermostat will actuate the thermostat switch mechanism regardless of the temperature being sensed by the remainder of the element. This makes the thermostats ideal for protecting large coils where air stratification could cause freezing conditions in a localized area.

The thermostat has a main and auxiliary contact unit. The main load circuit (LINE-M2) opens on temperature drop and simultaneously, an auxiliary or alarm circuit (LINE-Ml) closes on temperature drop.

NOTE: The reset button must be manually pressed down and released to resume normal fan system operation.

Electrical Ratings

Table 1.

Pole Number	Line-M2 (Main)				Line-M1 (Auxiliary)			
Motor Rating	**120 V**	**208 V**	**240 V**	**277 V**	**120 V**	**208 V**	**240 V**	**277 V**
AC Full Load Amps	16.0	9.2	8.0	—	6.0	3.3	3.0	—
AC Locked Rotor Amps	96.0	55.2	48.0	—	36.0	19.8	18.0	—
AC Non-Ind Amps	16.0	9.2	8.0	7.2	6.0	6.0	6.0	6.0
Pilot Duty-Both Poles	125 VA, 24 to 600 Vac 57.5 VA, 120 to 300 Vdc							

Mounting and Installation

General Guidelines

- Locate the sensing element in the downstream side of the coil.
- Locate the case and bellows where the ambient temperature is always warmer than the set point.
- Install the thermostat so that the reset button is readily accessible and the element bellows points down.
- Install as much of the bulb as possible in a horizontal plane. If too much of the bulb is vertical, it will not operate properly.
- Avoid sharp bends or kinks in the sensing element.

Large walk-in Ducts *(Figure 1)*

1. Attach the mounting bracket to the thermostat with the two round head screws provided.
2. Mount the two perforated steel strap hangers inside the duct with the wide part of the hanger strap parallel to the air flow.
3. Drill a hole in the side of the duct. With the bulb still coiled, thread the bulb through the hole using a rotary movement.
4. Mount the thermostat on the outside of the duct.
5. Carefully uncoil the bulb avoiding sharp bends or kinks in the sensing element.
6. Mount the bulb in a horizontal, serpentine manner, attaching the bulb to the strap as shown in detail in *Figure 1*.

The installation is complete.

NOTE: For an alternate method of mounting, use coil clips (Part Number 356-115) in the fins to hold the bulb in a horizontal, serpentine pattern.

Mounting and Installation, Continued

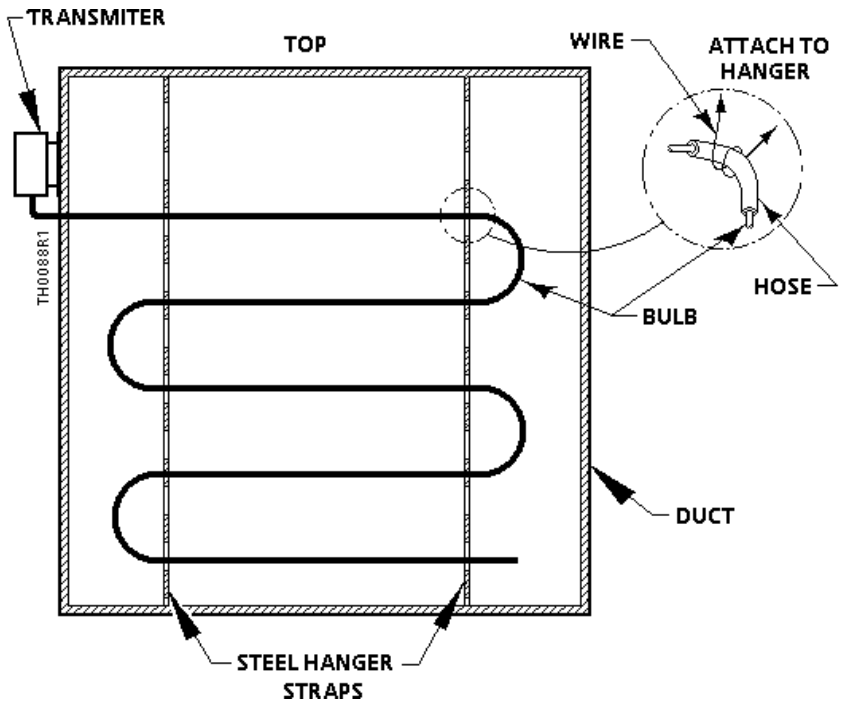


Figure 1. Typical Mounting in Walk-in Duct.

Limited Access Ducts (*Figure 2*)

1. Attach the mounting bracket to the thermostat with the two round head screws provided.
2. Attach a mounting flange (part number 808-412) on the opposite side of the duct (near the bottom) from where the thermostat will be mounted.
3. Mount a second flange on a 8-inch by 4-inch sheet metal plate. Cut an access opening for the bulb on the duct diagonally across from the duct-mounted flange. Drill mounting screw holes for the sheet metal plate.
4. Cut a length of copper tubing to fit diagonally across the duct. Stretch out the bulb and wrap it around the tubing. See *Figure 2.*
5. Insert the tubing and bulb through the access hole and into the duct-mounted flange. Fasten the 8-inch by 4-inch sheet metal plate to the duct.
6. Mount the thermostat on the outside of duct.

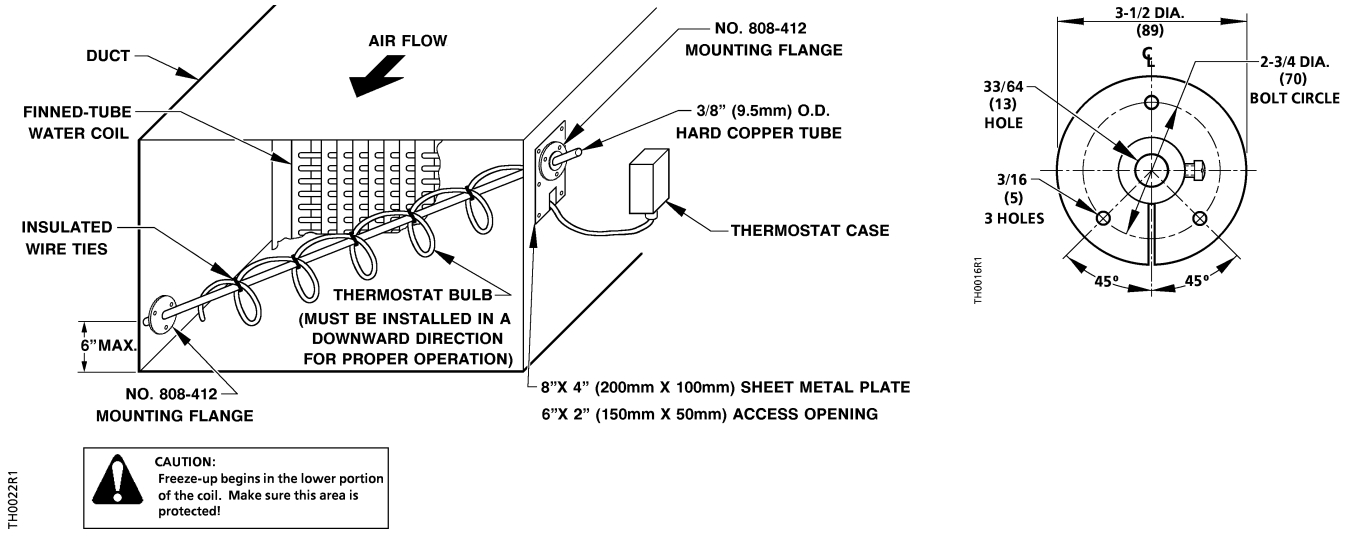


Figure 2. Bulb Mounting for Limited Access Ducts with 808-412 Mounting Flange.

Wiring

WARNING:

Disconnect the power supply before wiring connections are made to avoid possible electrical shock or damage to the equipment**.**

Make all wiring connections using copper conductors only and in accordance with the National Electrical Code and local regulations. Loads exceeding the rating of the thermostat should be handled by means of a relay or motor starter.

An opening for 1/2-inch conduit is provided in the bottom of the thermostat enclosure.

See *Figure 3* for a typical wiring diagram.

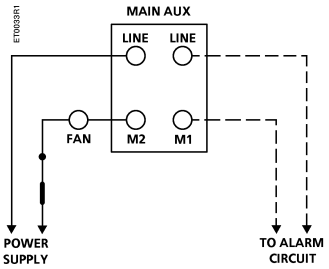


Figure 3. Typical Wiring Diagram.

CAUTION:

Use terminal screws furnished (#8-32 x 1/4-inch binder head screw). Longer terminal screws can interfere with switch mechanism and damage the switch.

Adjustment

After mounting the thermostat, adjust the temperature setting using the set point adjusting screw on the top of the enclosure. See *Figure 4.*

Observe a complete operating cycle to be sure that all components function correctly.

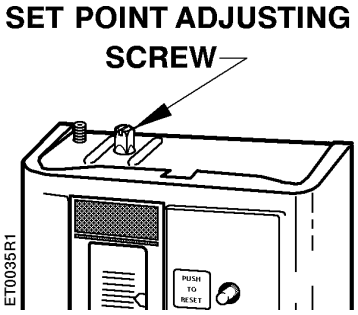


Figure 4. Set Point Adjustment Screw.

Calibration

There is no field calibration required for the thermostat.

Troubleshooting

Observe a complete operating cycle to be sure that all components function correctly.

Service

There is no servicing of the thermostat. Replace if inoperative.

Dimensions

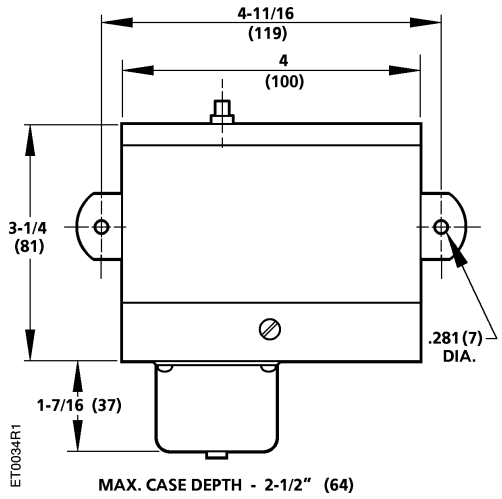


Figure 5. Dimensions in Inches (Millimeters).

Information in this publication is based on current specifications. The company reserves the right to make changes in specifications and models as design improvements are introduced. Powers is a trademark of Siemens Building Technologies, Inc. © 2000 Siemens Building Technologies, Inc.

VOLU-flo / OAM

Outside Air Monitor

AIR MONITOR CORPORATION

VOLU-flo / OAM

Product Description

The VOLU-flo/OAM is both a monitor for measurement of minimum outside airflow requirements, and a three-mode controller to maintain the inlet damper at the desired minimum, economizer or external setpoint. The VOLU-flo/OAM has been designed to directly measure inducted outside air, thereby assisting building owners and operators to meet the minimum outside air ventilation requirements of ASHRAE 62-99 and serve as a tool to assist in balancing the diverse demands of providing employee safety and occupant satisfaction while maintaining energy conservation.

Components and Features

Monitor/Controller Module

Accuracy. The VOLU-flo/OAM, with AUTO-zero, will maintain an accuracy of ±5% of measured airflow over the operating range of the user selectable 150-600 FPM or 250-1000 FPM intake velocities.

Microprocessor Based Functionality. All functions of monitor configuration, output and display scaling, calibration, and controller tuning are performed by the VOLU-flo/OAM's on-board microprocessor. Input to the microprocessor is via pushbutton.

Air Density Correction. The VOLU-flo/OAM corrects measured inlet airflow for ambient temperature variances and atmospheric pressure by means of its integral 100 ohm platinum RTD temperature sensor, and by entering site altitude into the microprocessor during initial system set-up. Via menu selection, the airflow output can be provided in actual or standard units of measurement.

Continuous Display of Process. A standard 2x20 liquid crystal display (LCD) is used during the configuration and calibration of the VOLU-flo/OAM, and provides a means to display two measured processes (volume, velocity, temperature) during normal operation.

Stainless Steel Construction. The Outside Reference Sensor and Inlet Airflow Sensor are both constructed of Type 316 stainless steel materials to resist corrosion due to the presence of salt or chemicals in the air. In addition, the signal connections on these two sensors and those on the NEMA enclosure are stainless steel, as is the exterior of the platinum RTD.

BAS Interface. While the VOLU-flo/OAM is capable of operating as a stand-alone monitor/controller, a wide variety of inputs and outputs were designed into the Monitor/Controller Module to facilitate coordinated operation with a facility building automation system (BAS). Interfaces with the BAS include:

- Digital inputs for fan system start status, switching to economizer setpoint, or to use the BAS provided adjustable operating setpoint.
- Digital outputs for high and low alarms, triggered when the measured airflow falls outside of a user selectable deadband around the control setpoint.
- Dual analog output; a 4-20mADC output corresponding to measured inlet airflow, and a damper controller output field configurable for 0-5VDC, 0-10VDC, or 4-20mADC via jumpers.
- An analog input, field selectable for 0-5VDC, 0-10VDC, or 4-20mADC via jumper, that is used as the controller setpoint.

Enclosures. The VOLU-flo/OAM is offered in four different enclosure packages to fit any application and installation:

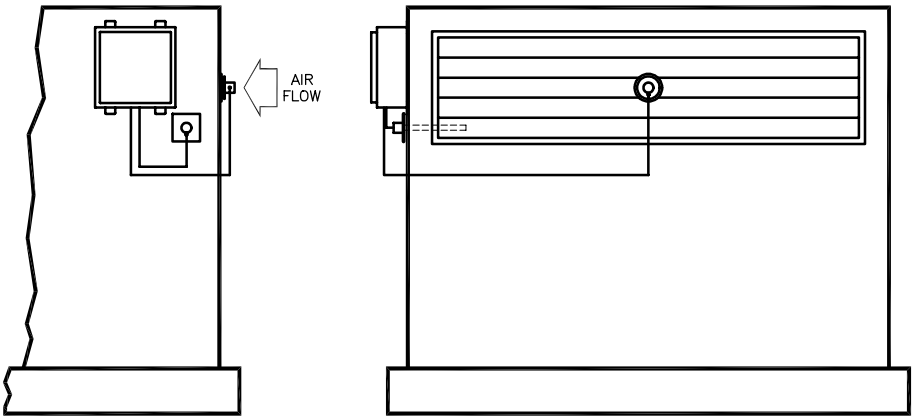
- NEMA 1 rated, painted carbon steel enclosure designed to be located indoors or inside the air handler.
- NEMA 4 rated, painted carbon steel enclosure designed for outdoor locations where the ambient temperature is consistently at 32^{0}F and above.
- NEMA 4 rated and insulated enclosure which includes a thermostatically controlled enclosure heater. For outdoor locations where the ambient temperatures may go as low as –40^{0}F.
- OEM mounting arrangement that permits the Monitor/Controller Module to be mounted into an existing OEM enclosure.

NEMA 4 Enclosure

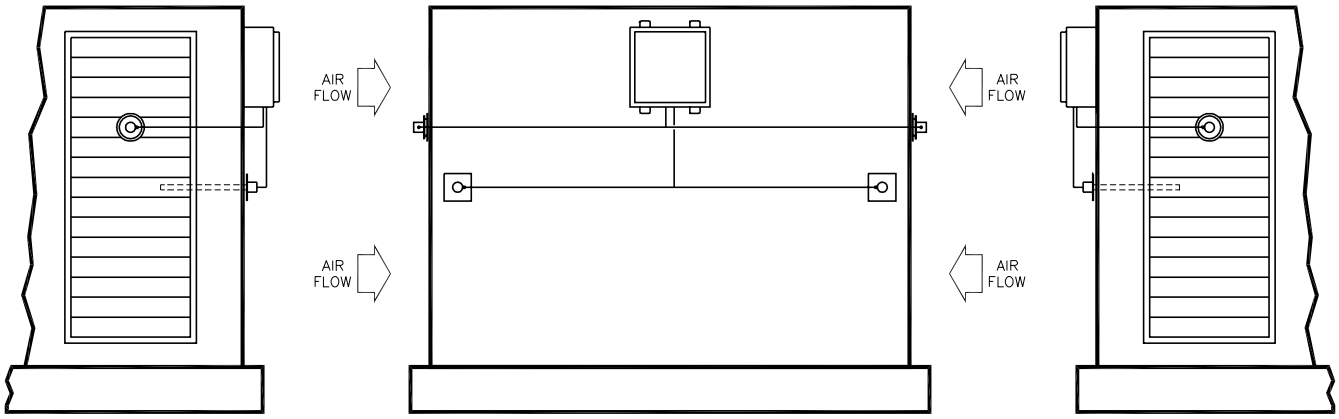
Outside Air Monitor

Application Guide

The VOLU-flo/OAM Monitor/Controller can be applied to most single and dual inlet package air handlers, as well as many built-up system inlets. Depicted below are typical single and dual inlet configurations. Contact the Factory with any unique configuration, or those that do not meet the stated Minimum Installation Requirements.



Single Inlet Configuration



Dual Inlet Configuration

Minimum Installation Requirements

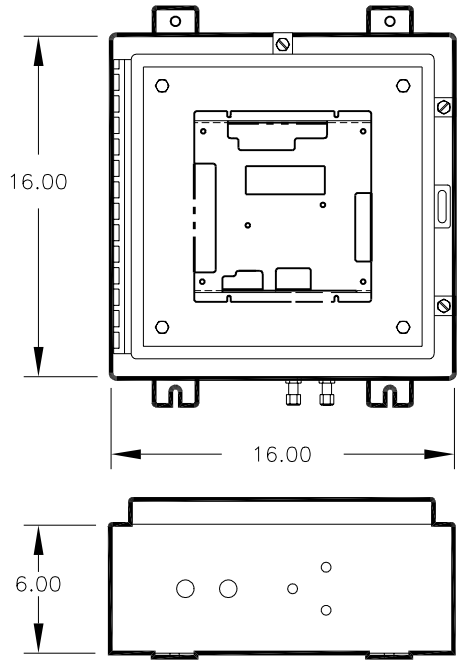
General Requirement. The VOLU-flo/OAM was designed for installation on packaged air handlers and built-up systems where the outside air intake is outfitted with an inlet louver, mist eliminator, and/or bird screen. For systems not so equipped, contact the Factory for application suitability.

Outside Reference Sensor. The Outside Reference Sensor is to be centrally positioned in, and mounted to the surface of the inlet. The Reference must be located upstream of any inlet louver, mist eliminator, bird screen, rain hood, etc.

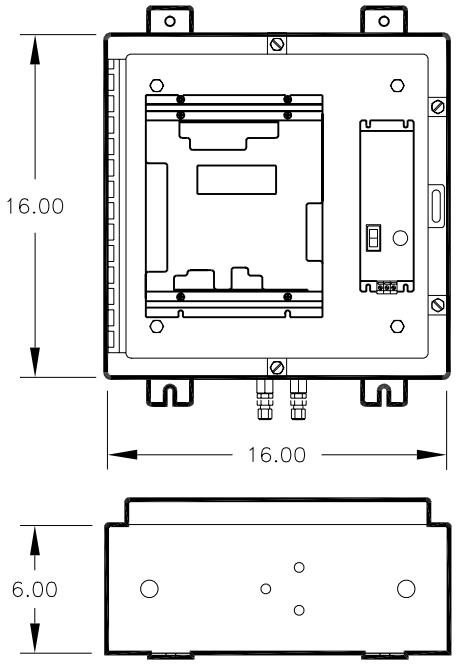
Inlet Airflow Sensor. The Inlet Airflow Sensor must be located downstream of any inlet louver, mist eliminator, bird screen, rain hood, etc., and upstream of the outside air intake control damper(s).

VOLU-flo / OAM

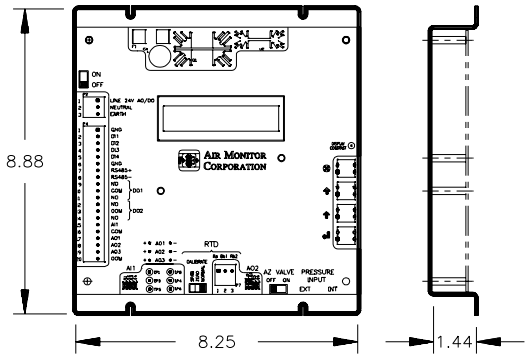
Dimensional Specifications



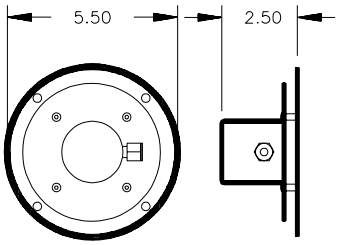
NEMA 1 and NEMA 4 Enclosure



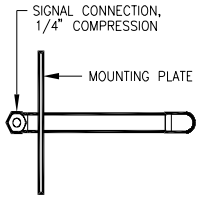
NEMA 4 Enclosure with Heater



Monitor/Controller Module



Outside Reference Sensor



Inlet Airflow Sensor

Suggested Specification

The monitor/controller shall be capable of direct measurement of airflow through an outside air inlet and produce dual outputs; one representing the measured airflow, and the other to control the inlet damper.

The monitor/controller shall contain an integral multi-line liquid crystal display for use during the configuration and calibration processes, and to display two measured processes (volume, velocity, temperature) during normal operation. All configuration, output scaling, calibration, and controller tuning will be performed digitally in the on-board microprocessor via input pushbuttons.

The monitor/controller shall measure inlet airflow with an accuracy of ±5% of reading over a range of 150-600 FPM or 250-1000 FPM and not have its reading affected by the presence of directional or gusting wind. Measured airflow shall be density corrected for ambient temperature variances, and atmospheric pressure due to site altitude.

The monitor/controller shall interface with existing building automation systems (BAS), accepting inputs for fan system start, economizer mode operation, and an external controller setpoint, and provide flow deviation alarm outputs.

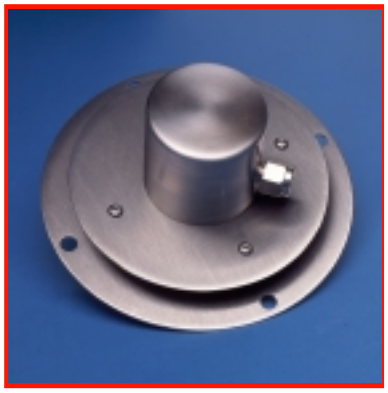
The sensors shall be constructed of materials that resist corrosion due to the presence of salt or chemicals in the air; all non-painted surfaces shall be constructed of stainless steel. The electronics enclosure shall be NEMA 1 [NEMA 4; NEMA 4 with enclosure heater and insulation].

The monitor/controller shall be the VOLU-flo/OAM as manufactured by Air Monitor Corporation, Santa Rosa, California.

Outside Air Monitor

Components and Features

Outside Reference Sensor. The patented design of the Outside Reference Sensor measures the pressure effect that prevailing wind will exert on the outside air inlet, yet remains unaffected by changes in wind direction, thus providing an accurate point of reference for measuring the air entering the inlet.



Outside Reference Sensor

Ease of Calibration. Unlike thermal measuring devices and calibrated dampers that can only be calibrated at the Factory, the VOLU-flo/OAM can easily have its calibration periodically verified using standard hand-held test and balance instrumentation.

Unaffected by Dirt and Moisture. The VOLU-flo/OAM does not utilize heated thermal sensors or pressure measuring ports that face into the airstream, thereby avoiding measurement instability caused by the variable presence of moisture, and measurement accuracy degradation due to dirt build-up around pressure sensor ports or on thermal sensor surfaces.

Inlet Airflow Sensor

Performance Specifications

Monitor

Accuracy. ±5% of actual airflow.

Range. 150-600 FPM or 250-1000 FPM.

Temperature Limits. –20 to 180ºF Storage.
+32 to 120ºF Operating, standard.
–40 to 120ºF Operating, with optional enclosure heater.

Signal Connections. ¼" compression type, stainless steel.

Indication

Display. Standard 2x20 character LCD provides two lines of data display.

Digital Inputs/Outputs

Digital Inputs. Three dry contact inputs; fan system status, economizer mode, and external controller setpoint.

Digital Outputs. Dual Form C dry contacts rated for 3 amps at 24VDC for alarm outputs to the BAS.

Analog Inputs/Outputs

Analog Input. A single input is field configurable via jumper for 0-5VDC, 0-10VDC or 4-20mADC. For use as the external controller setpoint.

Analog Outputs. Dual outputs; one 4-20mADC and the other configurable via jumper for 0-5VDC, 0-10VDC, or 4-20mADC. For measured airflow and damper controller outputs.

Power

Power Supply.
Standard: 24VAC (20-28VAC) or 24VDC (20-40VDC).
Optional: 120VAC (100-132VAC), with enclosure heater.

Power Consumption.
Standard: 18VA @ 24VAC; 13VA at 24VDC.
Optional: 36VA @ 120VAC, with enclosure heater.

Circuit Protection. Power input is isolated, fused, and reverse polarity protected.

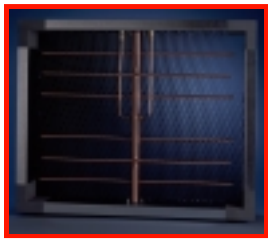
Model Selection Guide

VOLU-flo OAM – ☐ **–** ☐

Single Inlet – S
Dual Inlet – D

0 – For mounting in OEM cabinet
1 – NEMA 1
4 – NEMA 4
H – NEMA 4 with heater

Air Monitor's Product Families of Flow Measurement and Pressure Sensors



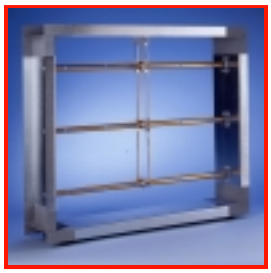
FAN-E AIRFLOW MEASURING STATION.
Multi-point, self-averaging, Pitot traverse station with integral air straightener-equalizer honeycomb cell. Capable of continuously measuring fan discharges or ducted airflow with an accuracy of two percent or better.

AMCA CERTIFIED in accordance with Standard 610.

VOLU-PROBE/1,2,3,4 AIRFLOW TRAVERSE PROBES.
Multi-point, self-averaging, Pitot Fechheimer airflow traverse probes with integral airflow direction correcting design. Four mounting configurations to fit every application.

AMCA CERTIFIED in accordance with Standard 610.

VOLU-PROBE/FI FAN INLET AIRFLOW PROBES.
Multi-point, self-averaging, Pitot Fechheimer airflow probes with integral airflow direction correcting design. For mounting directly in the inlet cones or bellmouth of centrifugal or vane-axial fans to measure fan capacities within three percent of actual flow.



VOLU-PROBE/VS AIRFLOW PROBE TRAVERSE STATIONS.
Multi-point, self-averaging, Pitot Fechheimer airflow probes factory mounted in a flanged sheet metal casing, with interconnecting tubing. Capable of measuring ducted airflow within two percent accuracy without using an air straightener or incurring significant resistance to airflow.

AMCA CERTIFIED in accordance with Standard 610.

S.A.P./1,2,3,4 and S.O.A.P. STATIC PRESSURE SENSORS.
Available in four separate mounting configurations, the S.A.P. family of static pressure sensors generate a steady, non-pulsating output of room, space or plenum pressure.

The S.O.A.P. was designed to accurately sense outside atmospheric air pressure.

STAT-PROBE STATIC PRESSURE TRAVERSE PROBE.
Multi-point, self-averaging, Fechheimer static pressure traverse probe for accurate sensing of duct or system static pressure in the presence of turbulent or rotational airflows.

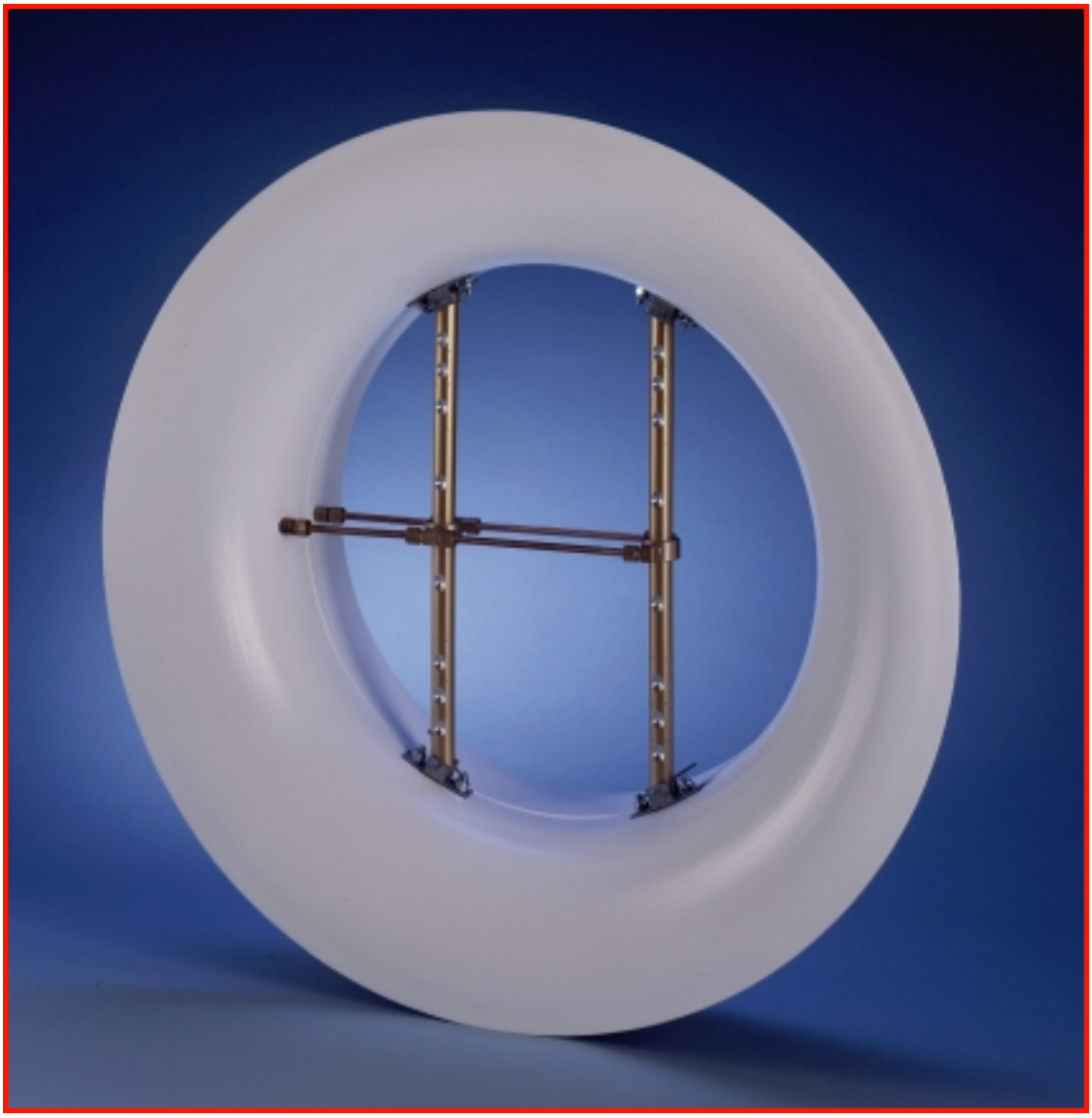
P.O. Box 6358 • Santa Rosa, CA 95406 • Tel 800-Airflow • Fax 707-526-9970 • www.airmonitor.com

AIR MONITOR CORPORATION

125-200 (1/00)

VOLU-probe/FI

Fan Inlet Airflow Traverse Probe



AIR MONITOR CORPORATION

VOLU-probe/FI

Product Description

The VOLU-probe/FI Fan Inlet Airflow Traverse Probe consists of a set of two offset mounted traverse probes, each with multiple sensors formulated on a concentric area basis. The VOLU-probe/FI combines the air processing effect of the nozzle-shaped fan inlet bellmouth with its unique Fechheimer Pitot derivative of the multi-point, self-averaging Pitot to accurately measure inlet velocity pressure (and calculable air volume) for most types of fans.

The VOLU-probe/FI probes are mounted directly in the inlet bellmouth at the throat (minimum diameter). When mounted per Factory recommendations, the measurement capability of the VOLU-probe/FI is not impaired by inlet screens, fan shafts, drive pulleys, guards, adjustable blade pitch (vane-axial fans), etc., downstream of the probe location.

How It Works

The VOLU-probe/FI operates on the principle of a multi-point, self-averaging Pitot tube to measure the total pressure and static pressure components of airflow. Total pressure sensing ports, with chamfered entrances to eliminate air direction effects, are located on the leading surface of the VOLU-probe/FI to sense the impact pressure (P_t) of the approaching airstream (see Figure 2). Pairs of static pressure sensing ports, positioned at the ideal angle on opposing surfaces of the probe, minimize the error inducing effect of directionalized airflow. As the flow direction veers from the normal, one static sensor is exposed to a higher pressure (P_s + part of P_t), whereas the other static sensor experiences a lower pressure (P_s – part of P_t) of the same magnitude, thereby balancing out the undesired effect of total pressure (P_t). It is this unique design of offset static pressure and chamfered total pressure sensors (see Figure 1) that makes the VOLU-probe/FI insensitive to approaching multi-directional, rotating airflow with yaw and pitch up to 30° from straight flow, thereby assuring the accurate measurement of the sensed airflow rate without the presence of an airflow straightener upstream. This unique design of the VOLU-probe/FI is covered by U.S. Patent No. 4,559,835.

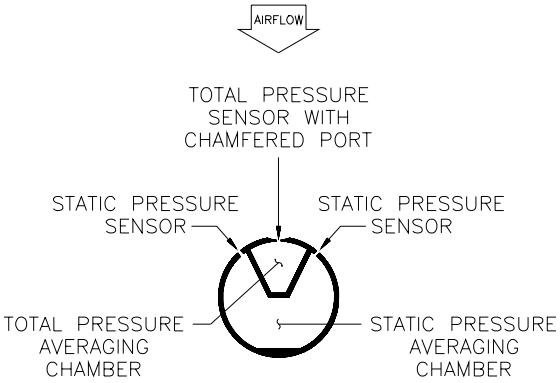


Figure 1

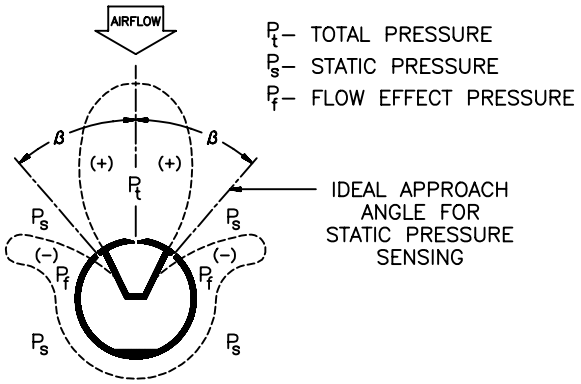


Figure 2

Features

Extruded Aluminum, Anodized Construction. The standard VOLU-probe/FI is constructed of anodized extruded aluminum. The exterior surface of the probe has an anodized finish which prevents the forming of aluminum oxide, and inhibits the effect of many corrosive atmospheres. VOLU-probe/FI's for fan inlets smaller than 20" in diameter are constructed using copper tubing. The VOLU-probe/FI is also available in Type 316 stainless steel, PVC, Kynar, and other materials of construction.

Performs Equal-Weighted Averaging of Flow Signals. The VOLU-probe/FI instantaneously averages, on an equal-weighted basis, all the pressures sensed at the multiple total and static pressure sensors along the length of its probes, in the respective averaging manifolds provided, producing final "averaged" total and static pressure values which are transmitted to the probe's external signal fittings.

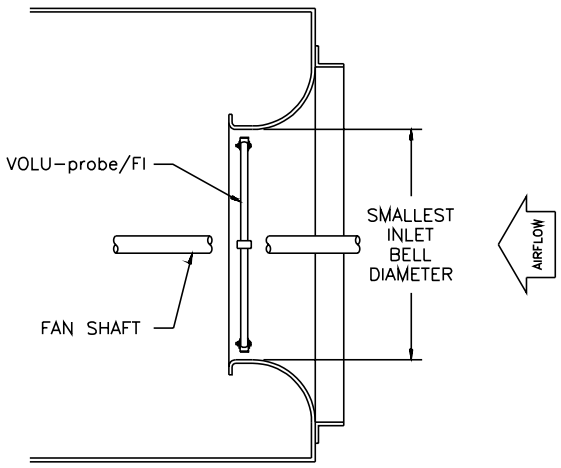
Measurement Accuracy. When correctly installed per Air Monitor's recommended methods and positions, the VOLU-probe/FI fan inlet probe will produce assured measuring accuracy of 3% of actual flow, without significantly impacting fan performance or contributing to fan generated noise.

No Sensor Protrusions. The VOLU-probe/FI's total and static pressure sensors are all contained within the confines of the external surface of the probe. There are no protruding sensors to be bent, broken, or otherwise damaged during installation or with continuous fan operation.

No Correction of Calibration Factors. The VOLU-probe/FI produces velocity pressure (total and static pressure) signals that are identical in basic magnitude to those obtained with the use of a Pitot tube or airflow measuring station and, therefore, do not require the application of any calibration factors.

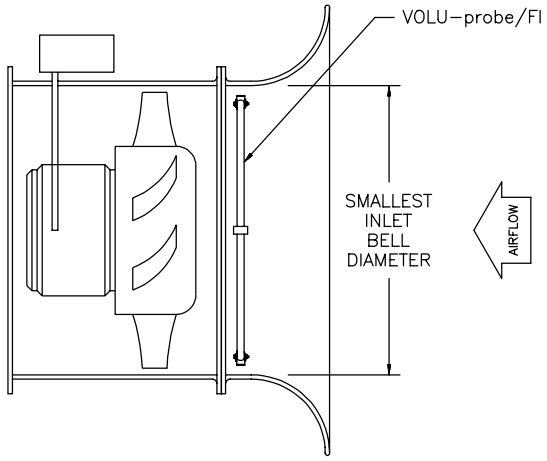
Fan Inlet Airflow Traverse Probe

Standard Fan Inlet Configurations



Note. Where double width, double inlet centrifugal fans are utilized in HVAC system design, a set of the offset-mounted VOLU-probe/FI fan inlet airflow traverse probes must be mounted in each of the two fan inlets and interconnected via signal tubing.

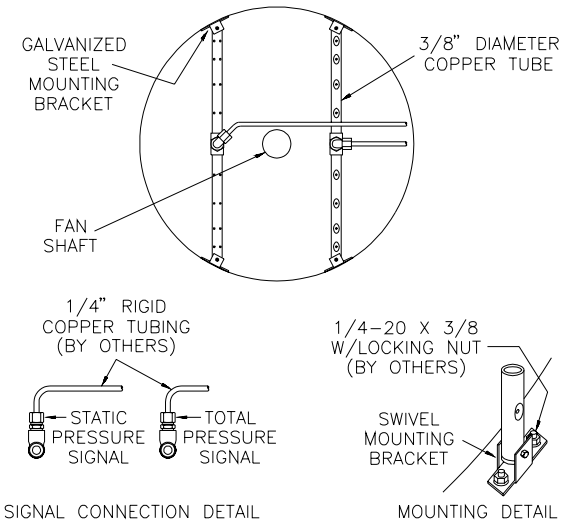
CENTRIFUGAL FANS



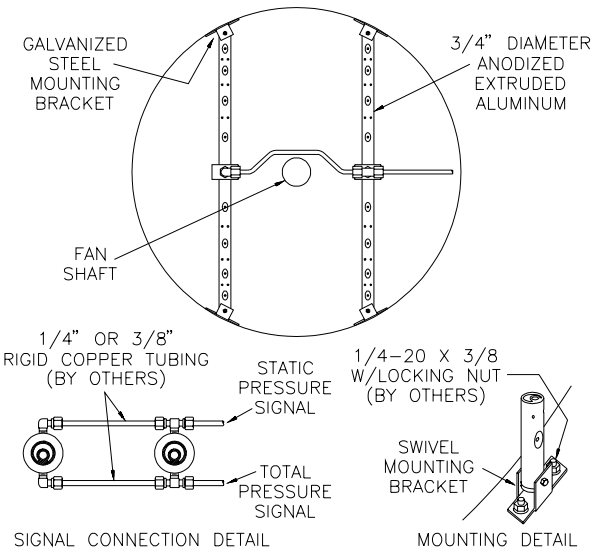
Note. When vane-axial fans are installed in a ducted configuration on the inlet side, the application may require the use of the VOLU-probe/1 designed for ducted airflow. Contact Factory for recommendation.

VANE-AXIAL FANS

Dimensional and Construction Information



FOR INLETS LESS THAN 20" IN DIAMETER


GALVANIZED STEEL MOUNTING BRACKET
3/4" DIAMETER ANODIZED EXTRUDED ALUMINUM
FAN SHAFT
1/4" OR 3/8" RIGID COPPER TUBING (BY OTHERS)
STATIC PRESSURE SIGNAL
TOTAL PRESSURE SIGNAL
SIGNAL CONNECTION DETAIL
1/4–20 X 3/8 W/LOCKING NUT (BY OTHERS)
SWIVEL MOUNTING BRACKET
MOUNTING DETAIL

FOR INLETS 20" IN DIAMETER OR LARGER

VOLU-probe/FI

Application and Sizing

To apply the VOLU-probe/FI to fan inlets, the following determinations must be made:

1. The VOLU-probe/FI was designed specifically to mount in the minimum diameter point of the fan inlet bell. Mounting at any other location on the inlet bell will produce a repeatable flow signal that may require a field determined factor to correlate to actual fan output.

2. When ordering, provide the minimum diameter (mounting location) of the fan inlet bellmouth. DO NOT provide fan wheel diameter.

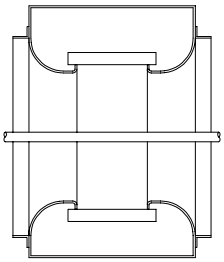
3. When ordering, advise the presence and size of any fan shaft in the inlet.

4. Due to variations in fan design and construction, contact the Factory regarding application suitability for installation on fans having inlet vanes or dampers, extra large motor shafts, motor mountings in the fan inlet, and any auxiliary equipment that could interfere with probe mounting and connecting tubing.

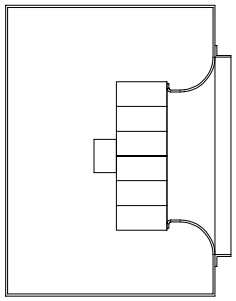
Approved Fan Inlet Installations

It is recognized that any obstruction, depending on the obstruction cross-sectional area versus the fan inlet area ratio, has the potential to affect fan output performance. This factor should be given consideration during the process of fan size selection.

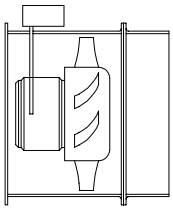
Air Monitor's VOLU-probe/FI has been specifically engineered with three different size inlet probes so as to minimize any impact on operating performance for fans of the types shown below.



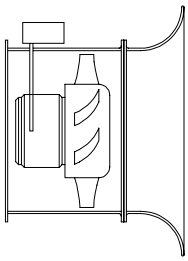
CENTRIFUGAL FAN



PLUG FAN



DUCTED VANE AXIAL



VANE AXIAL
WITH BELLMOUTH

Note: On fans with ducted inlets, the VOLU-probe/FI must still be mounted in the fan inlet bell; otherwise, refer to the VOLU-probe/1,2,3,4 brochure for ducted airflow probes.

Suggested Specification

Fan Inlet Airflow Traverse Probes. Provide on the indicated fans, airflow traverse probes mounted in the fan inlets capable of continuously measuring the air handling capacity (air volume) of the respective centrifugal [or plug, vane-axial] fan(s).

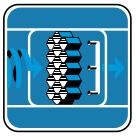
The fan inlet airflow traverse probes shall contain multiple total and static pressure sensors placed at concentric area centers along the exterior surface of the cylindrical probes and internally connected to their respective averaging manifolds. Sensors shall not protrude beyond the surface of the probe, nor be adversely affected by particle contamination normally present in building system airflows.

The fan inlet airflow traverse probes shall have symmetrical averaging signal takeoffs, and shall be of aluminum construction with hard anodized finish [copper construction] with galvanized steel mounting hardware.

The fan inlet airflow traverse probes shall not significantly impact fan performance or contribute to fan generated noise levels. The probes shall be capable of producing steady, non-pulsating signals of standard total and static pressure, without need for flow corrections or factors, with an accuracy of 3% of actual flow over a fan operating range of 6 to 1 capacity turndown.

The fan inlet airflow traverse probes shall be the VOLU-probe/FI as manufactured by Air Monitor Corporation, Santa Rosa, California.

P.O. Box 6358 • Santa Rosa, CA 95406 • Tel 800-Airflow • Fax 707-526-9970 • www.airmonitor.com



AIR MONITOR CORPORATION

125-067 (4/99)

Functional Devices, Inc.
RIB®
310 South Union Street
P.O. Box 368
Russiaville, Indiana
46979-0368

Office (765) 883-5538
Orders (800) 888-5538
Fax (765) 883-7505
http://www.functionaldevices.com

RIBU1C — Enclosed Relay 10 Amp SPDT with 10-30 Vac/dc/120 Vac Coil

c UL us LISTED

MADE IN U.S.A.

Functional Devices, Inc. A600B 2004

GENERAL SPECIFICATIONS

 # Relays & Contact Type: One (1) SPDT Continuous Duty Coil
Expected Relay Life: 10 million cycles minimum mechanical
Operating Temperature: -30 to 140° F
Operate Time: 20mS
Relay Status: LED On = Activated
Dimensions: 1.7" x 2.8" x 1.5" with 1/2" NPT nipple
Wires: 16", 600V Rated
Approvals: UL Listed, UL916, UL864, C-UL Canada
California State Fire Marshal
Housing Rating: Plenum, NEMA 1
Gold Flash: Yes
Override Switch: No

CONTACT RATINGS

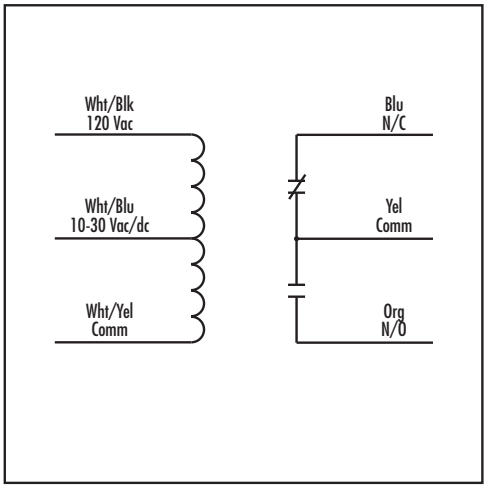
10 Amp resistive	120-277 Vac
10 Amp resistive	28 Vdc
480 VA Pilot Duty	240-277 Vac
480 VA Ballast	277 Vac
600 Watt Tungsten	120 Vac N.O.
240 Watt Tungsten	120 Vac N.C.
1/3 HP for N.O.	120-240 Vac
1/6 HP for N.C.	120-240 Vac
1/4 HP for N.O.	277 Vac
1/8 HP for N.C.	277 Vac

COIL CURRENT

30 mA @ 10 Vac	12 mA @ 10 Vdc
32 mA @ 12 Vac	14 mA @ 12 Vdc
42 mA @ 24 Vac	16 mA @ 24 Vdc
50 mA @ 30 Vac	18 mA @ 30 Vdc
25 mA @ 120 Vac	

COIL VOLTAGE INPUT

10-30 Vac/dc, 120 Vac; 50-60 Hz
DROP OUT = 2.1 Vac / 2.8 Vdc
PULL IN = 9 Vac / 10 Vdc



NOTES

- Can be ordered in a NEMA 4 enclosure by adding "-N4" to the end of the model number.
- Can be ordered in a red enclosure by adding "-RD" to the end of the model number.

NOTES:

SIEMENS

Technical Specification Sheet
Document No. 149-261P25
February 26, 2009

Analog Sensors—1000 Ω Platinum (375 α) RTD

Description

1000 Ohm Platinum (375 α) RTD sensors provide input for cost-effective, accurate temperature sensing (detecting) via a 20 AWG twisted, shielded cable pair. The sensor resistance varies according to the temperature being measured. Several models are available for specific mounting and sensing applications.

Figure 1. Surface Mounted Temperature Sensor.

Figure 2. Outside Air Temperature Sensor.

Figure 3. Duct (Single Point) Temperature Sensor (544-339-18 Shown with AQM2000 Accessory).

Figure 4. Duct (Averaging) Flexible Temperature Sensor.

Figure 5. Duct (Averaging) Rigid Temperature Sensor.

Figure 6. Liquid Immersion Temperature Sensor.

Specifications

Temperature Monitoring Ranges	See *Sensor Specifications*
Output Signal	Changing resistance
Elements	Platinum (or equivalent) wire resistance type
Accuracy	See *Sensor Specifications*
Reference Resistance at 32ºF (0ºC)	1000 Ohm

Sensor Specifications

Sensor Applications	Temperature Range (See Tolerance Formula at Bottom of Table)	Element Package	Part Number
Surface Mount - Pipe	-40°F to 240°F (-40°C to 116°C)	2-inch × 4-inch metal box with clamps	544-089
Outdoor Air		Through-the-wall	544-578
Duct - Single Point		4-inch (10 cm) 8-inch (20 cm) 18-inch (45 cm)	544-339-4 544-339-8 544-339-18
Duct - Averaging, Rigid	20°F to 120°F (-7°C to 49°C) Special Tolerances: 20°F ±2.3°F 70°F ±1.0°F 120°F ±2.8°F	18-inch (46 cm) 24-inch (60 cm) 36-inch (91 cm) 48-inch (122 cm)	544-343-18 544-343-24 544-343-36 544-343-48
Duct - Averaging, Flexible		8-foot(2.4 m) 16-foot (4.9 m) 24-foot (7.3 m)	544-342-8 544-342-16 544-342-24
Liquid Immersion	-40°F to 240°F (-40°C to 116°C)	2.5-inch (5 cm) 4-inch (10 cm) 6-inch (15 cm) Stainless steel wells NEMA 4/IP56 (immersion heads only)	544-577-25 544-577-40 544-577-60

Tolerance Formula: $\pm(0.54°F+(0.005 \times |T_{°F}-32|))$ $[\pm(0.3°C+(0.005 \times |T_{°C}|))]$
where $T_{°F}$ ($T_{°C}$) is the operating temperature point within the transmitter's range

(Example: For a sensor operating at 100°F; Tol = $\pm(0.54°F+(0.005 \times |100°F-32°F|)$ or ±0.88°F)

Accessories

AQM2000	Flange Gasket Kit (order separately if an adjustable depth is required for 544-339-18 duct point temperature sensors.)
544-577-RK	Immersion Repair Kit

Information in this document is based on specifications believed correct at the time of publication. The right is reserved to make changes as design improvements are introduced. Other product or company names mentioned herein may be the trademarks of their respective owners.
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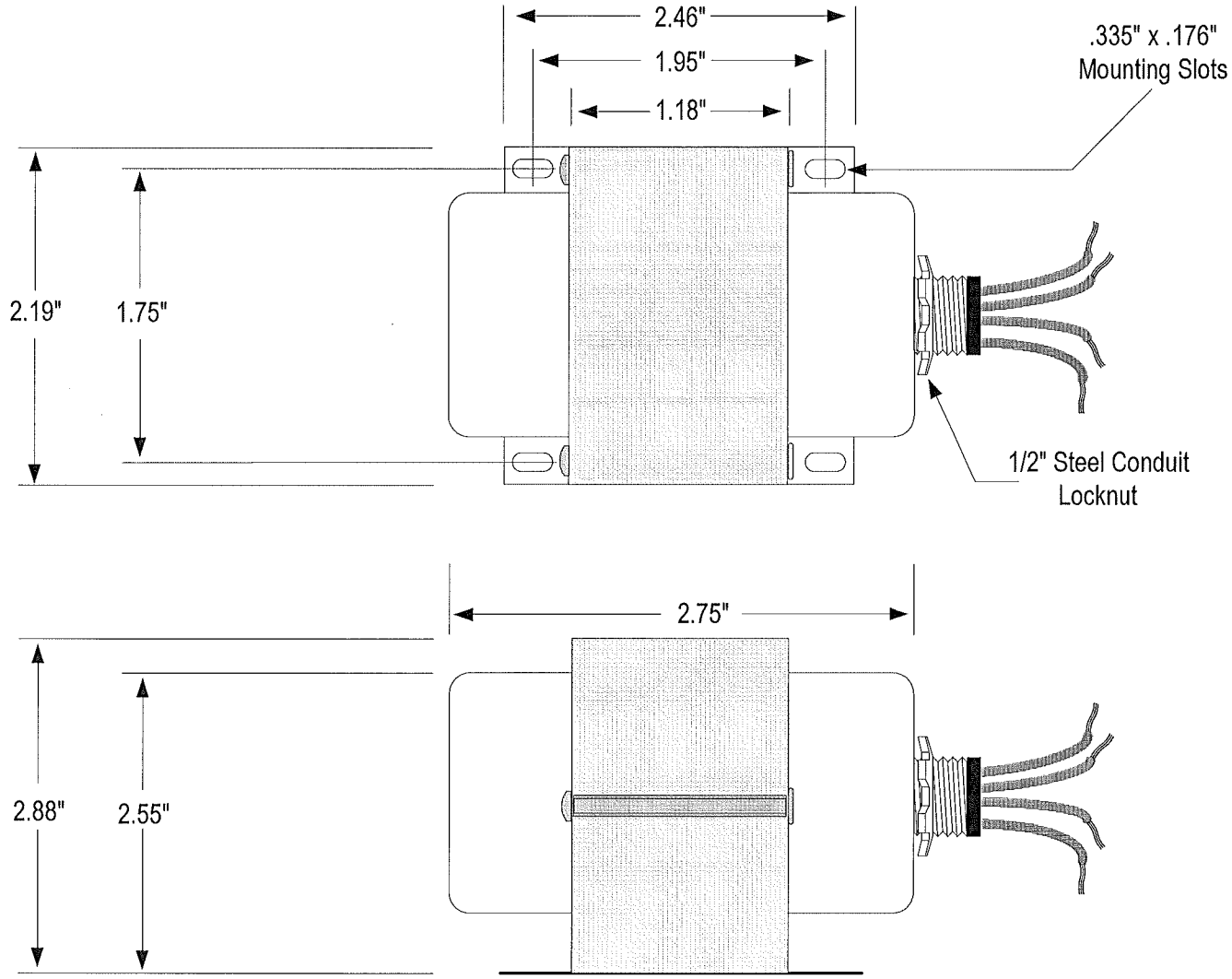
CORE COMPONENTS
PRODUCT OF LECTRO COMPONENTS, INC.
Carol Stream, IL
www.corehvac.com

LE11300

Part Number LE11300 - 120-024-040-TF				
Rev.	Description	By	App.	Date
*	First Release	CDC	CDC	10/24/00
NOTE				
All Dimensions are Ref. Only				



Specifications

Input:	120V
Output:	24V
VA Rating:	40VA
Frequency Rating:	50/60 Hz
Circuit Breaker Type:	Internal 75 Deg. C Thermal Cut-Out
Configuration:	Steel End Bells
Mounting(s):	Slotted Foot Mounts and Threaded Flange Hub
Primary Wires:	7.5" Long with .375" ends Stripped and Tinned
Secondary Wires:	7.5" Long with .375" ends Stripped and Tinned
Approvals:	UL Listed for US and Canada File E173056. Class II Transformer. CSA Certificate LR108412-1.

CORE COMPONENTS
PRODUCT OF LECTRO COMPONENTS, INC.
Carol Stream, IL
www.corehvac.com

LE11300

Part Number LE11300 - 120-024-040-TF				
Rev.	Description	By	App.	Date
*	First Release	CDC	CDC	10/24/00
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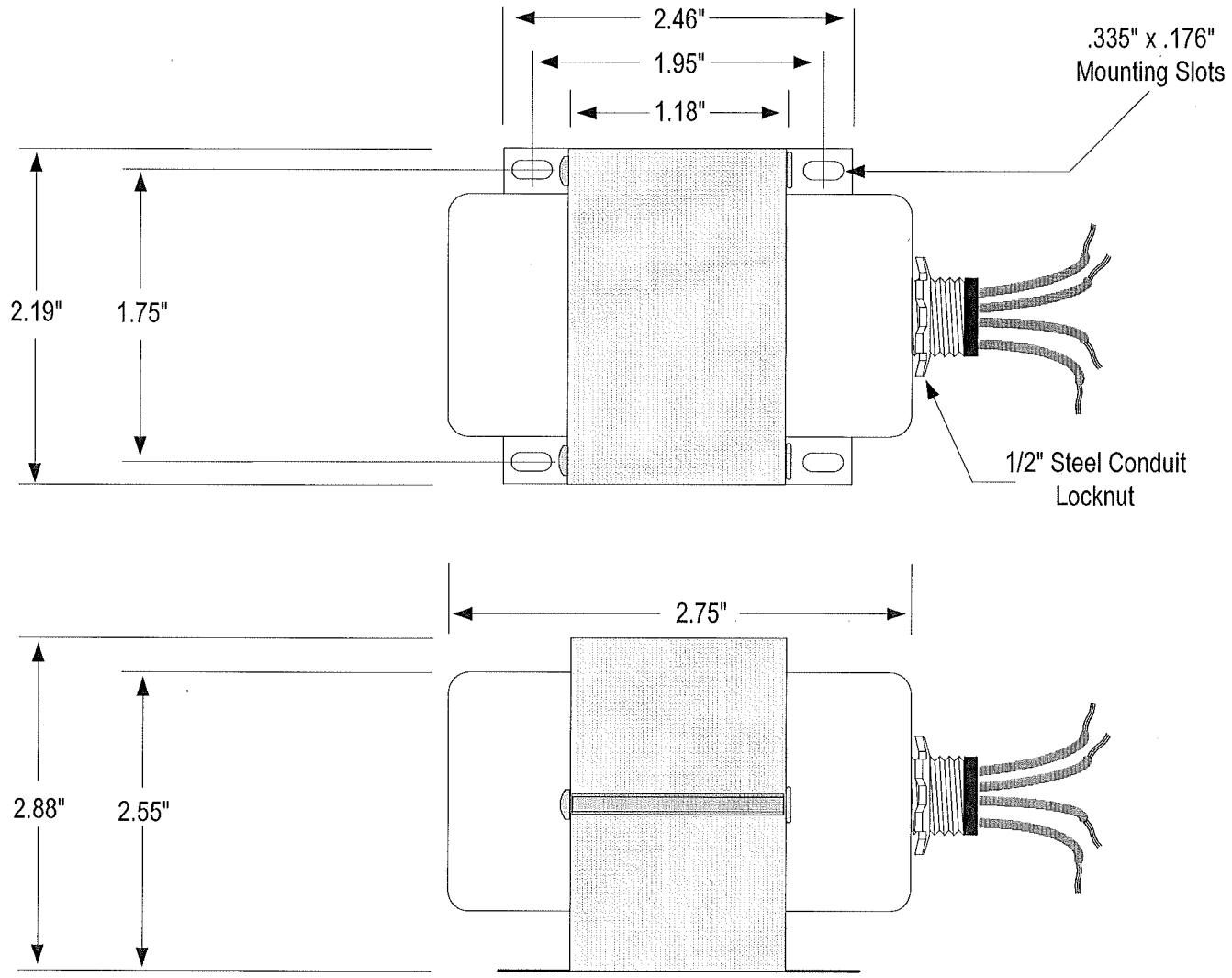

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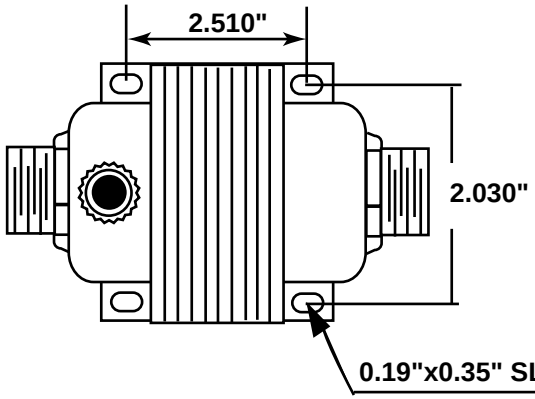
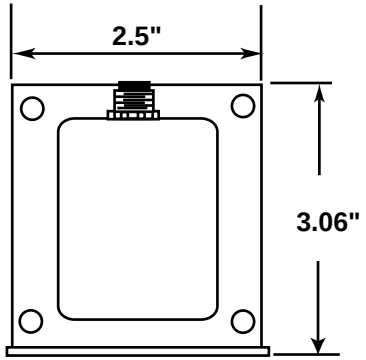
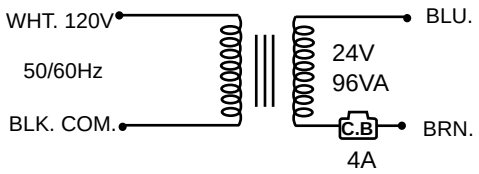
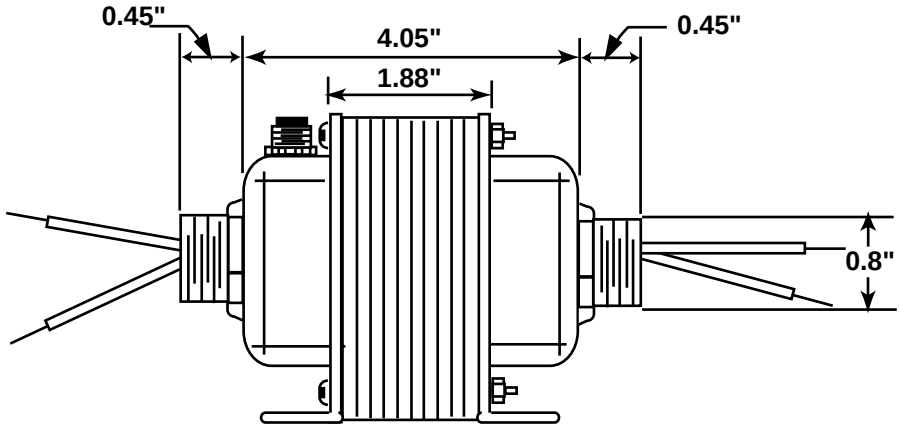
MODEL NO: LE12001	PART NO: 120-024-100-2TF-CB-SP

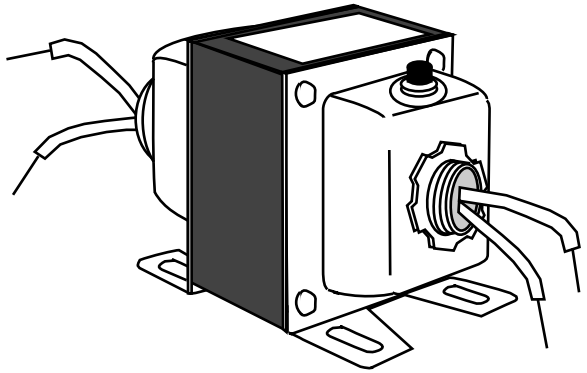








UL1015#18 LENGTH 20" IN COLOR "BLUE" & "BROWN"



UL1015#18 LENGTH 20" IN COLOR "BLACK","WHITE"

UNIT: inch ± 0.04

REPORT BY	CHECK BY	APPROVED BY	DATE:	
			REV NO:	PAGE : 1 OF 1

SMALLEST SPLIT-CORE CURRENT SENSOR IN THE INDUSTRY!

H300

Hawkeye® 300

Micro Split-Core Fixed Setpoint Digital Output Current Switches

LOWEST TURN-ON IN THE INDUSTRY!

5 Year Warranty

The **Hawkeye 300 Series** go/no current switch provides a cost-effective solution for monitoring status on vents, exhaust fans, recirculation pumps and other fixed loads where belt loss is not a concern.

APPLICATIONS

- Monitoring on/off status of electrical loads
- Monitoring direct drive units, exhaust fans and other fixed loads
- Verifying lighting run times

On/off status for direct-drive fans, pumps, and process motors

- More reliable for status than relays across auxiliary contacts
- Ideal for direct-drive units, unit vents, fan coil units, exhaust fans and other fixed loads
- Great for lighting status–less expensive than 277V relays
- Low 0.15A turn-on. . .ideal for small exhaust fans (Not intended to detect belt loss)
- Mounting bracket provides installation flexibility

Monitor status of fans, pumps, motors & other electrical loads

- Split-core 300 for fast retrofit installation
- Micro size fits in tight enclosures
- 100% solid-state, no moving parts to fail
- Polarity insensitive output
- 5-year limited warranty

CURRENT SENSING THE ULTIMATE PROOF OF FLOW

Maximize Reliability
Minimize Installed Cost

ORDERING INFORMATION

MODEL	AMPERAGE RANGE	OUTPUT TYPE	OUTPUT RATING (MAX.)
H300	0.15 - 60A	N.O., Solid-state	1.0A@30VAC/DC

ACCESSORIES

DIN Rail Clip Set...See page 234

RoHS Compliant

CE

LISTED 3T60 UL 508 c UL us E150462

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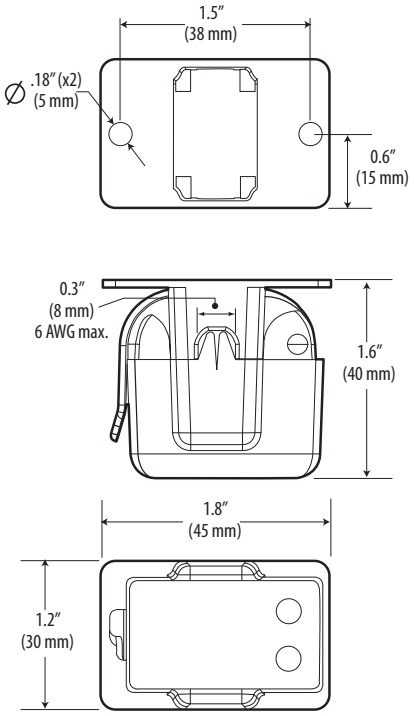
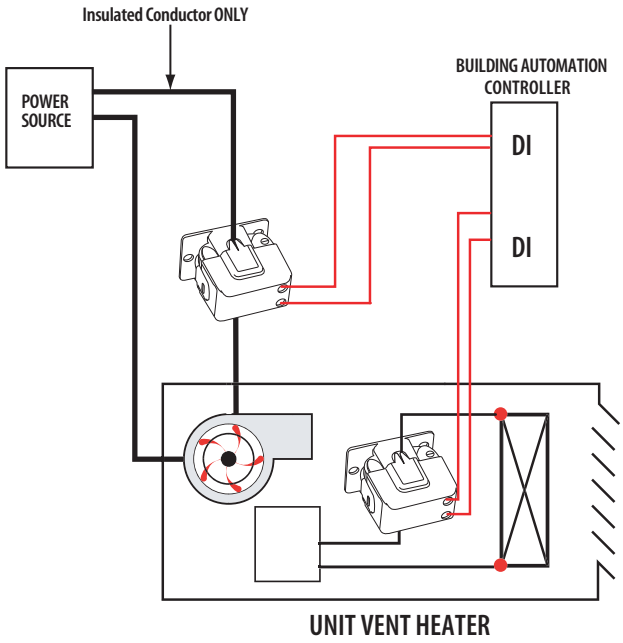
DIMENSIONAL DRAWINGS

H300



APPLICATIONS/WIRING EXAMPLE



SPECIFICATIONS

Amperage Range	Fixed 0.15 to 60A
Sensor Power	Induced
Output	1.0A@30VAC/DC
Insulation Class	600VAC rms (UL), 300VAC rms (CE), insulated conductor only
Frequency Range	50/60Hz.
Temperature Range:	-15° to 60°C
Humidity Range	10 - 90% RH non-condensing
Terminal Blocks	16-22 AWG, 7in-lbs

Do not use the LED status indicators as evidence of applied voltage.

Specification Note: For CE compliance, conductor shall be insulated according to IEC 61010-1:2001, Installation Category III or equivalent. The unit design provides for functional insulation only .

 ©2007 Veris Industries

Current Switches: Adjustable Trip Point

Detect Belt Loss, Coupling Shear, And Mechanical Failure

DESCRIPTION

Hx08 Series and H701 adjustable current switches offer high performance, with a wide array of amperage range options. These products can accurately detect belt loss, coupling shear, or other mechanical failure on loads from 1/5 to 100 HP.

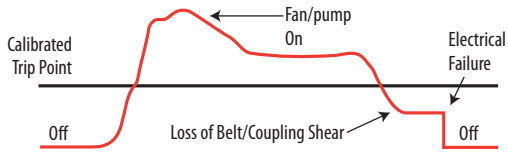
APPLICATIONS

- Detecting belt loss, coupling shear, and mechanical failure
- Verifying lighting circuit and other electrical service run times
- Monitoring status of industrial process equipment
- Monitoring status of critical motors (compressor, fuel, etc.)

FEATURES

- High performance devices in split- and solid-core housings
- Adjustable trip point...precise current trip point setting
- Minimum trip point as low as 0.5A (H608)...eliminates the need for multiple wraps of the conductor through the sensor even on loads as small as 1/5 HP
- Small size...fits easily inside small enclosures
- Self-gripping iris on the split-core housing for easy installation
- Status LEDs available for easy setup and local indication
- Bracket on H908 can be installed in three different configurations...installation flexibility in tight spaces
- 1 Amp status output...increased application flexibility
- All devices are 100% solid state for high reliability and polarity insensitive for trouble-free installation, with a 5-year warranty

DETECTS BELT LOSS/COUPLING SHEAR!



Now you can easily detect when drive belts slip, break, or pump couplings shear. In fact, a typical HVAC motor that loses its load has a reduction of current draw of up to 50%. That's why our sensors are the industry standard for status.

CURRENT SENSING THE ULTIMATE PROOF OF FLOW

Maximize Reliability
Minimize Installed Cost

SPECIFICATIONS

5 Year Warranty

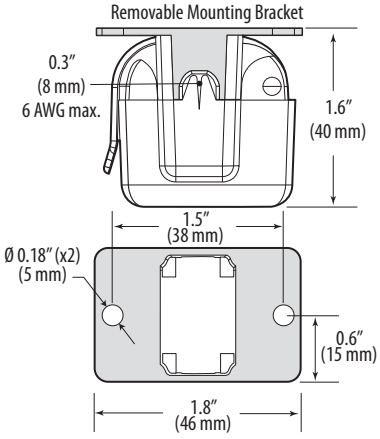
Sensor Power	Induced from monitored conductor
Insulation Class	600VAC RMS (UL), 300VAC RMS (CE)
Frequency Range	50/60 Hz
Temperature Range	-15° to 60°C (5° to 140°F)
Humidity Range	10-90% RH, non-condensing
Hysteresis	10% (typical)
Terminal Block Wire Size	H608, H701, H708, H808, H908: 24-14 AWG (0.2 to 2.1 mm^2); H308: 22-16 AWG (0.3 to 1.3 mm^2)
Terminal Block Torque	H608, H701, H708, H808, H908: 3.5 to 4.4 in-lbs (0.4 to 0.5 N-m); H308: 7 in-lbs (0.8 N-m)
Agency Approvals	UL 508 open device listing; CE: EN61010-1:2001-02, CAT III, pollution degree 2, basic insulation

Do not use the LED status indicators as evidence of applied voltage.

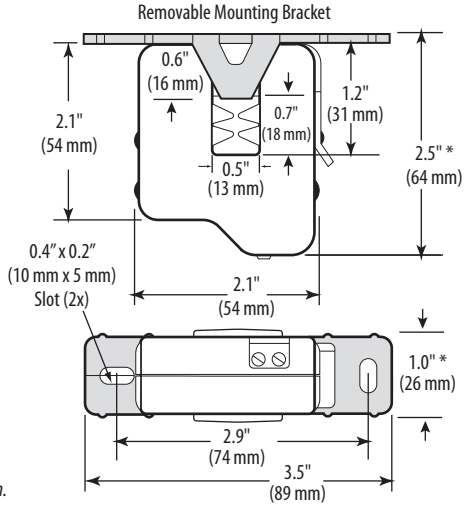
VERIS INDUSTRIES

DIMENSIONAL DRAWINGS

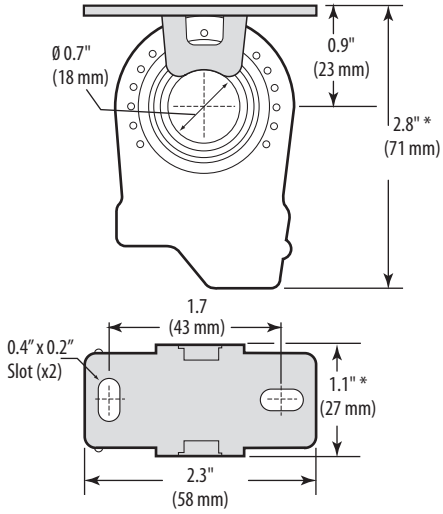
H308



H608

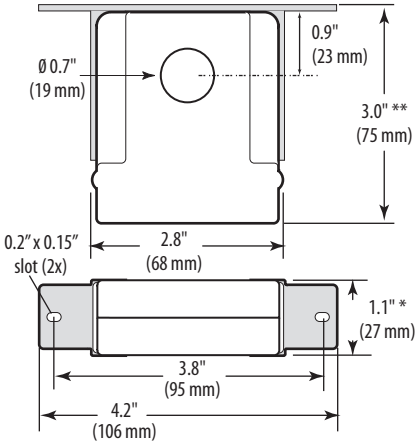


H808

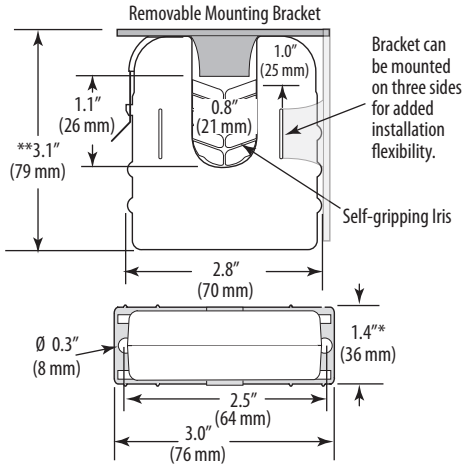


* *Terminal block may extend up to 1/8" over the height dimensions shown.*

H708/701

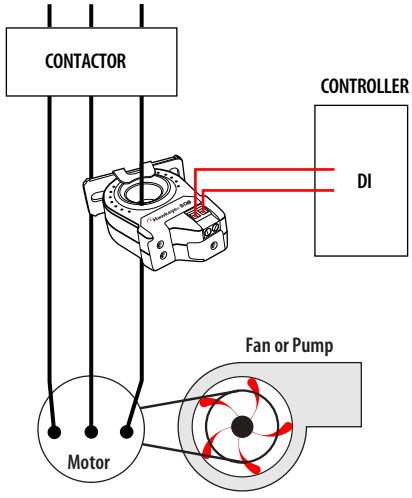


H908



APPLICATION/WIRING DIAGRAM

Monitoring Fan /Pump Motors for Positive Proof of Flow



CURRENT MONITORING

ORDERING INFORMATION

CE c UL us LISTED E150462 RoHS Compliant

MODEL	AMPERAGE RANGE	STATUS OUTPUT (max.)	MIN. TRIP POINT	HOUSING	STATUS LED	UL	CE	RoHS
H308	0.75 - 50A	N.O. 1.0A@30VAC/DC	0.75A or less	Split-Core	●	●	● [2]	●
H608	0.5 - 175A		0.5A or less	Split-Core	●	● [1]	●	●
H701	1 - 135A		1.0A or less	Solid-Core		●	●	
H708	1 - 135A		1.0A or less	Solid-Core	●	●	●	
H808	0.75 - 50A		0.75A or less	Solid-Core	●	●	●	●
H908	2.5 - 135A		2.5A or less	Split-Core	●	●	●	●

[1] *Listed for use on 75°C insulated conductors.*
[2] *Product provides functional insulation only.*

ACCESSORIES

DIN Rail Clip Set (AH01 for H6xx, H8xx, H9xx; AH27 for H3xx)
DIN Rail (AV01) and DIN Stop Clip (AV02)

RH Series — General Purpose Midget Relays

Key features of the RH series include:

- **Compact midget size saves space**
- **High switching capacity (10A)**
- **Choice of blade or PCB style terminals**
- **Relay options include indicator light, check button, and top mounting bracket**
- **DIN rail, surface, panel, and PCB type sockets available for a wide range of mounting applications**

UL Recognized
Files No. E67770
E59804
E64245

CSA Certified
File No.LR35144

File No. BL951113332319

D

Specifications

Contact Material	Silver cadmium oxide
Contact Resistance	50mΩ maximum (initial value)
Minimum Applicable Load	24V DC/30mA, 5V DC/100mA (reference value)
Operating Time	SPDT (RH1), DPDT (RH2): 20ms maximum 3PDT (RH3), 4PDT (RH4): 25ms maximum
Release Time	SPDT (RH1), DPDT (RH2): 20ms maximum 3PDT (RH3), 4PDT (RH4): 25ms maximum
Power Consumption	**SPDT** (RH1): DC: 0.8W AC: 1.1VA (50Hz), 1VA (60Hz) **DPDT** (RH2): DC: 0.9W AC: 1.4VA (50Hz), 1.2VA (60Hz) **3PDT** (RH3): DC: 1.5W AC: 2VA (50Hz), 1.7VA (60Hz) **4PDT** (RH4): DC: 1.5W AC: 2.5VA (50Hz), 2VA (60Hz)
Insulation Resistance	100MΩ min (measured with a 500V DC megger)
Dielectric Strength	**SPDT** (RH1) Between live and dead parts: 2,000V AC, 1 minute; Between contact circuit and operating coil: 2,000V AC, 1 minute; Between contacts of the same pole: 1,000V AC, 1 minute
	DPDT (RH2), **3PDT** (RH3), **4PDT** (RH4) Between live and dead parts: 2,000V AC, 1 minute; Between contact circuit and operating coil: 2,000V AC, 1 minute; Between contact circuits: 2,000V AC, 1 minute; Between contacts of the same pole: 1,000V AC, 1 minute
Frequency Response	1,800 operations/hour
Temperature Rise	Coil: 85°C maximum Contact: 65°C maximum
Vibration Resistance	0 to 6G (55Hz maximum)
Shock Resistance	SPDT/DPDT: 200N (approximately 20G) 3PDT/4PDT: 100N (approximately 10G)
Life Expectancy	Electrical: over 500,000 operations at 120V AC, 10A; (over 200,000 operations at 120V AC, 10A for SPDT [RH1], 3PDT [RH3], 4PDT [RH4]) Mechanical: 50,000,000 operations
Operating Temperature	–30 to +70°C
Weight	SPDT: 24g, DPDT: 37g (approximately) 3PDT: 50g, 4PDT: 74g (approximately)

See page D-29 for dimensions.

Operational Characteristics

Maximum Continuous Applied Voltage (AC/DC) at 20°C	110% of the rated voltage
Minimum Operating Voltage (AC/DC) at 20°C	80% of the rated voltage
Drop-Out Voltage (AC)	30% or more of the rated voltage
Drop-Out Voltage (DC)	10% or more of the rated voltage

Ordering Information

Order standard voltages for fastest delivery. Allow extra delivery time for non-standard voltages.

Basic Part No.	Coil Voltage:
RH2B-U	**AC110-120V**

Part Numbers

Part Numbers: RH Series with Options

Termination	Contact Configuration	Basic Part No.	Indicator Light	Check Button	Indicator Light and Check Button	Top Bracket
B (blade)	SPDT	RH1B-U	RH1B-L*	—	—	RH1B-UT
	DPDT	RH2B-U	RH2B-UL	RH2B-UC	RH2B-ULC	RH2B-UT
	3PDT	RH3B-U	RH3B-UL	RH3B-UC	RH3B-ULC	RH3B-UT
	4PDT	RH4B-U	RH4B-UL	RH4B-UC	RH4B-ULC	RH4B-UT
V2 (PCB 0.078" [2mm] wide)	SPDT	RH1V2-U	RH1V2-L*	—	—	—
	DPDT	RH2V2-U	RH2V2-UL	RH2V2-UC	RH2V2-ULC	—
	3PDT	RH3V2-U	RH3V2-UL	RH3V2-UC	RH3V2-ULC	—
	4PDT	RH4V2-U	RH4V2-UL	RH4V2-UC	RH4V2-ULC	—

1. * *RH1B(V2)-L is* **not** *UL recognized.*
2. *For Coil and Contact Ratings, see the next page.*

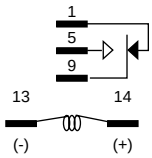
D

Part Numbers: Sockets

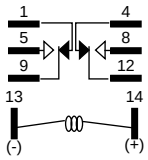
Relay	Standard DIN Rail Mount	Finger-Safe DIN Rail Mount	Surface Mount	Panel Mount	PCB Mount	Spring (optional)
RH1B	SH1B-05	SH1B-05C	—	SH1B-51	SH1B-62	SY2S-02F1 SFA-101 SFA-202 SY4S-51F1 SFA-301 SFA-302
RH2B	SH2B-05	SH2B-05C	SH2B-02	SH2B-51	SH2B-62	SY4S-02F1 SFA-101 SFA-202 SY4S-51F1
RH3B	SH3B-05	SH3B-05C	—	SH3B-51	SH3B-62	SH3B-05F1 SFA-101, -202 SY4S-51F1
RH4B	SH4B-05	SH4B-05C		SH4B-51	SH4B-62	SH4B-02F1 SFA-101, -202 SY4S-51F1

3. *See Section F for details on sockets. All DIN rail mount sockets shown above can be mounted using DIN rail BNDN1000.*

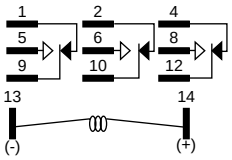
Internal Circuit



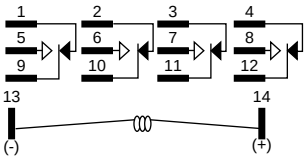
RH1



RH2



RH3



RH4

Ratings

Coil Ratings

Rated Voltage		Rated Current ±15% at 20°C								Coil Resistance ±15% at 20°C			
		60Hz				50Hz							
		SPDT		DPDT		3PDT		4PDT		SPDT	DPDT	3PDT	4PDT
AC	6V	150mA	200mA	280mA	330mA	170mA	238mA	330mA	387mA	18.8Ω	9.4Ω	6.0Ω	5.4Ω
	12V	75mA	100mA	140mA	165mA	86mA	118mA	165mA	196mA	76.8Ω	39.3Ω	25.3Ω	21.2Ω
	24V	37mA	50mA	70mA	83mA	42mA	59.7mA	81mA	98mA	300Ω	153Ω	103Ω	84.5Ω
	120V*	7.5mA	11mA	14.2mA	16.5mA	8.6mA	12.9mA	16.4mA	19.5mA	7,680Ω	4,170Ω	27,70Ω	22,20Ω
	240V†	3.2mA	5.5mA	7.1mA	8.3mA	3.7mA	6.5mA	8.2mA	9.8mA	3,1200Ω	15,210Ω	12,100Ω	91,20Ω
		SPDT		DPDT		3PDT		4PDT		SPDT	DPDT	3PDT	4PDT
DC	6V	128mA		150mA		240mA		250mA		47Ω	40Ω	25Ω	24Ω
	12V	64mA		75mA		120mA		125mA		188Ω	160Ω	100Ω	96Ω
	24V	32mA		36.9mA		60mA		62mA		750Ω	650Ω	400Ω	388Ω
	48V	18mA		18.5mA		30mA		31mA		2,660Ω	2,600Ω	1,600Ω	15,50Ω
	110V‡	8mA		9.1mA		12.8mA		15mA		13,800Ω	12,100Ω	8,600Ω	7,340Ω

** For RH2 relays = 110/120V AC.*
† For RH2 relays = 220/240V AC.
‡ For RH2 relays = 100/110V DC.

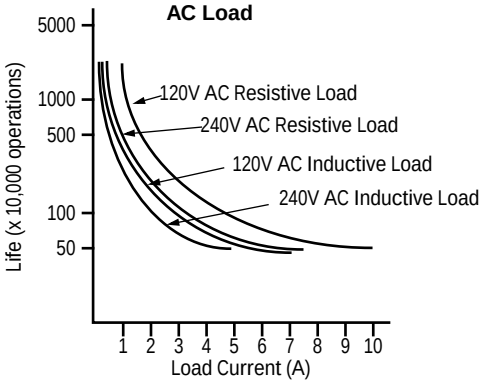
D

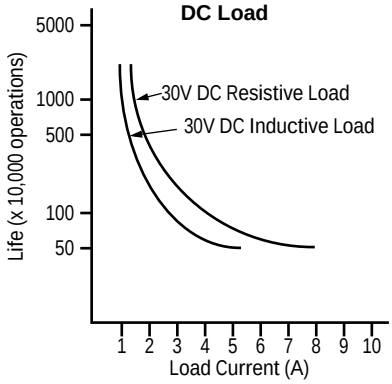
Contact Ratings

		Resistive				Inductive				Motor Load	
Voltage	Rating	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT
28V DC	UL	10A	10A	10A	10A	7.5A	—	—	7.5A	—	—
30V DC	UL	10A	10A	10A	—	7A	7A	—	—	—	—
	CSA				10A		7.5A			—	—
	Nominal							7.5A	7.5A	—	—
110V DC	Nominal	0.5A	0.5A	0.5A	0.5A	0.3A	0.3A	0.3A	0.3A	—	—
120V AC	UL	10A	10A	10A	10A	7.5A	—	—	7.5A	1/6	1/6
	CSA						7.5A			—	—
	Nominal					7A		7.5A			
240V AC	UL	10A	10A	—	7.5A	7A	7A	*	5A	1/3	1/3
	CSA							7A		—	—
	Nominal	7A	7.5A	7.5A	4.5A	5A	5A	5A			

*1. * 6.5A/pole, 20A total.*
2. Inductive load cos ø = 0.3, L/R = 7ms.

Electrical Life Curves





SIEMENS

Technical Instructions
Document No. 155-173P25
EA GCA-1
November 5, 2012

OpenAir™

GCA Series Spring Return 160 lb-in Electronic Damper Actuators

Description	The OpenAir 24 Vac/dc spring return 160 lb-in (18 Nm) electronic actuator is designed for digital or analog control of building HVAC dampers.
Features	• Brushless DC motor technology with stall protection • Bi-directional fail-safe spring return • Patented self-centering shaft coupling • Manual override • 160 lb-in (18 Nm) torque • 5° preload as shipped from factory • Offset and span adjustment models available • Models with independently adjustable dual auxiliary switches available • UL and cUL listed; CE certified
Application	These actuators are designed for use in constant or variable air volume installations for the control of return air, mixed air, exhaust, and face and bypass dampers requiring up to 160 lb-in (18 Nm) torque. They are designed for applications that require the damper to return to a fail-safe position when there is a power failure.

Product Numbers

Table 1.

Product Number	Operating Voltage			Control				Cables		Built-in Control Options			
	24 Vac ± 20%	24 Vdc ±10%	120 Vac ± 10%	0 to 10 Vdc	2 to 10 Vdc or 0 to 10 Vdc	Floating	2-position	Standard	Plenum	Position Feedback	Dual Auxiliary Switches	Signal Inversion	Offset 0 to 5 Vdc Span 2 to 30 Vdc
GCA121.1U	•	•					•	•					
GCA121.1P	•	•					•		•				
GCA126.1U	•	•					•	•			•		
GCA126.1P	•	•					•		•		•		
GCA221.1U			•				•	•					
GCA226.1U			•				•	•			•		
GCA131.1U	•	•				•		•					
GCA131.1P	•	•				•			•				
GCA132.1U	•	•				•		•		•			
GCA136.1U	•	•				•		•			•		
GCA136.1P	•	•				•			•		•		
GCA151.1U	•	•			•			•		•		•	
GCA151.1P	•	•			•				•	•		•	
GCA156.1U	•	•			•			•		•	•	•	
GCA156.1P	•	•			•				•	•	•	•	
GCA161.1U	•	•		•				•		•			
GCA161.1P	•	•		•					•	•			
GCA163.1U	•	•		•				•		•			•
GCA163.1P	•	•		•					•	•			•
GCA164.1U	•	•		•				•		•	•		•
GCA164.1P	•	•		•					•	•	•		•
GCA166.1U	•	•		•				•		•	•		
GCA166.1P	•	•		•					•	•	•		

Warning/Caution Notations

WARNING:		Personal injury/loss of life may occur if you do not perform a procedure as specified.
CAUTION:		Equipment damage may occur if you do not perform a procedure as specified.

Specifications

Ambient Conditions	Ambient temperature	
	operation	-25°F to 130°F (-32°C to 55°C)
	storage and transport	-40°F to 158°F (-40°C to 70°C)
	Ambient humidity (non-condensing)	95% rh
Agency Certification		UL listed to UL60730 (to replace UL873)
		cUL certified to Canadian Standard C22.2 No. 24-93
CE Conformity		
	Electromagnetic compatibility (EMC)	2004/108/EC
	Immunity for all models, except GCA132.xx	EN61000-6-2
	Immunity for GCA132.xx	EN61000-6-1
	Emissions for all models	EN61000-6-3

Power Supply		GCA16x	GCA15x	GCA13x	GCA12x	GCA22x
		24 Vac ± 20% 24 Vdc ± 10%	24 Vac ± 20% 24 Vdc ± 10%	24 Vac± 20% 24 Vdc ± 10%	24 Vac ± 20% 24 Vdc ± 10%	120 Vac ± 10% —
	Frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
	Power Consumption					
	running	7 VA/5W	7 VA/5W	7 VA/5W	7 VA/5W	8 VA
	holding	5 VA/3W	5 VA/3W	5 VA/3W	5 VA/3W	6 VA

Control Signal		GCA16x	GCA15x	GCA13x	GCA12x	GCA22x
	Input Signal (Y–G0) voltage input	0 to 10 Vdc (max. 35 Vdc)	0 to 10 Vdc or 2 to 10 Vdc (max. 35 Vdc)	Floating	2-Position	2-Position
	input resistance	>100K ohms	>100K ohms	—	—	—

Feedback Signal		GCA16x	GCA15x	GCA13x	GCA12X	GCA22x
	Position output signal (U-G0) voltage output	0 to 10 Vdc	0 to 10 Vdc	0 to 1000 ohms <10 Ma (GCA 132x only) Load <1W	—	—
	maximum output current	±1 mA	+1 mA, -.5 mA	—	—	—

Function	Running/spring return torque	
	Operating with 24 Vac	160 lb-in (18 Nm)
	Maximum torque	<360 lb-in (40 Nm)
	Runtime for 90°	
	operating with motor	90 sec
	closing (on power loss) with spring return	15 seconds typical

NOTE: At -25°F**,** spring return is 142 lb-in (16 Nm).

Equipment rating	Class 2, in accordance with UL/CSA

Specifications, Continued

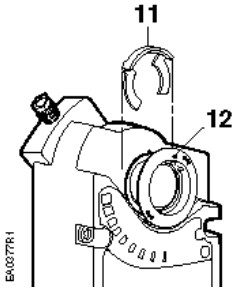
Mounting	Nominal angle of rotation	90°
	Maximum angular rotation	95°
	Shaft size	3/8-inch to 1-inch (8 mm to 25.6 mm) diameter
		1/4-inch to 5/8-inch (6 to 18 mm) square
	Minimum shaft length	3/4-inch (20 mm)
Auxiliary features	Control signal adjustment	
	Offset (start point)	0 Vdc to 5 Vdc
	Factory setting	0 Vdc
	Span	2 Vdc to 30 Vdc
	Dual auxiliary switches	
	AC rating (Standard cable)	24 Vac to 250 Vac
		AC 6A resistive
		AC 2A FLA, 12 LRA
	AC rating (Plenum cable)	24 Vac
		AC 4A resistive
		AC 2A, FLA, 12 LRA
	DC rating (Standard/Plenum cable)	12 Vdc to 30 Vdc
		DC 2A
	Switch Range	
	Switch A	0 to 90° with 5° intervals
	Recommended range usage	0 to 45°
	Factory setting	5°
	Switch B	0 to 90° with 5° intervals
	Recommended range usage	45° to 90°
	Factory setting	85°
	Switching hysteresis	2°
Housing	Enclosure	NEMA 2, IP54 per EN 60 529 in vertical to horizontal 90° See Figure 16.
		NEMA 3R rated when installed with ASK75.1U Weather Shield in the vertical position. See Figure 17. See *Accessories,* Figure 9.
	Material	Die-cast aluminum alloy
	Gear lubrication	Silicone-free

WARNING:
Apply only AC-line voltage from the same phase or only UL-Class 2 voltage to the switching outputs of both auxiliary switches A and B. Mixed operation is not permissible.

NOTE: With plenum cables, only UL-Class 2 voltage is permitted.

Miscellaneous	Pre-cabled connection	18 AWG
	Cable length	3 feet (0.9 m)
	Noise level	<45 dBA (running)
	Life cycle	Designed for over 60,000 full strokes and a minimum of 1.5 million repositions at rated torque and temperature.
	Dimensions	See Figure 29.
	Weight	4.85 lb (2.2 kg)

Actuator Components



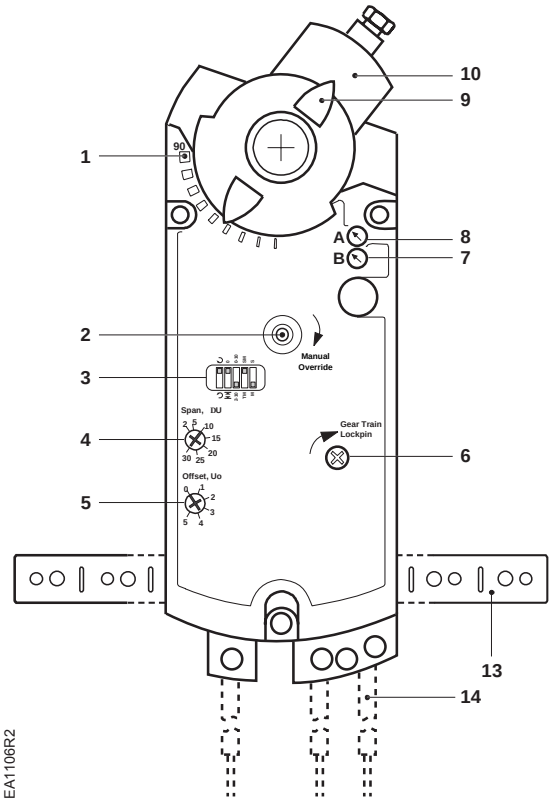


Figure 1. Modulating GCA Actuator.

NOTE: Not all features are on all models. See Table 1 for a listing of features per model.

Legend

1. Positioning scale for angle of rotation
2. Manual override wrench opening and direction of rotation arrow
3. DIP switches
4. Span adjustment
5. Offset (start point) adjustment
6. Gear train lock pin
7. Auxiliary switch B
8. Auxiliary switch A
9. Position indicator
10. Self-centering shaft adapter
11. Shaft adapter locking clip
12. Position indicator adapter
13. Mounting bracket
14. Connection cables

Accessories

NOTE: The control signal adjustment cannot be added in the field. Order the product number that includes the option(s).

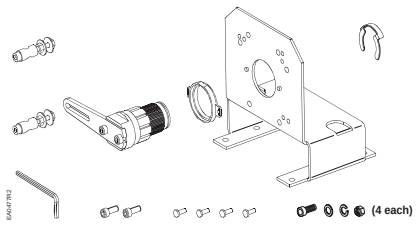


Figure 2. Floor Mount Kit.

ASK71.1U: Allows foot mounting of OpenAir actuators. Should be used for in-the-air stream applications, and generally, anywhere a foot-mounted actuator can be mounted. Kit contains:

- Crank arm for changing angular rotation into a linear stroke.
- Support bearing ring to minimize side loading on the actuator's output bearing.
- Mounting bracket.
- Required mounting fasteners.

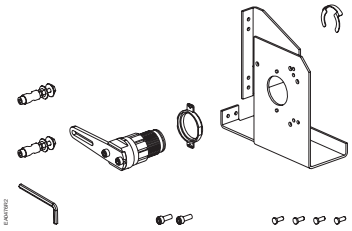


Figure 3. Frame Mount Kit.

ASK71.2U: Allows mounting OpenAir actuators directly to damper frame. Should be used with louvers and vents and in applications where floor mount kit is not possible. Kit contains:

- Crank arm for changing angular rotation into a linear stroke.
- Support bearing ring to minimize side loading on the actuator's output bearing.
- Mounting bracket.
- Required mounting fasteners.

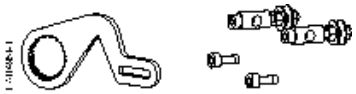


Figure 4. Crank Arm Kit.

ASK71.3: Allows direct-coupled actuator to provide an auxiliary linear drive. Crank arm kit can be used to simultaneously drive a set of opposing or adjacent dampers with single actuator. Kit includes:

- Crank arm to attach to the splined hub of the shaft adapter.
- Other required mounting fasteners.

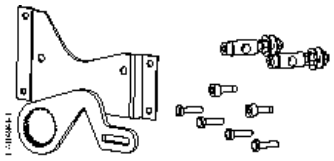


Figure 5. Crank Arm Kit with Mounting Bracket.

ASK71.4: Allows economical mounting of OpenAir actuator to a variety of surfaces. Kit should be used in applications where the actuator can be rigid-surface mounted and linear stroke output is required. Kit includes:

- Crank arm to attach to the splined hub of the shaft adapter.
- Mounting bracket.
- Other required mounting fasteners.

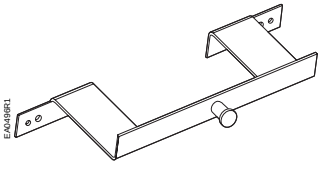


Figure 6. Tandem Mount Bracket.

ASK73.1: Bracket provides an extended anti-rotation pin allowing two OpenAir actuators to directly drive a single damper shaft. Tandem mounting bracket for two GCA 2-position and floating control actuators mounted on the same side of the damper shaft.

Accessories, Continued

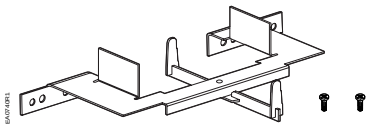


Figure 7. Tandem Mount Bracket.

ASK73.2U: Bracket provides an extended anti-rotation pin allowing two OpenAir modulating actuators to directly drive a single damper shaft. Tandem mounting bracket for two GCA16x (standard to 10 Vdc modulating control) Series Actuators mounted on the same side of the damper shaft.

NOTE: For applications requiring single damper shaft operation by up to four GCA modulating control signal actuators mounted on each side of the damper shaft, use the GCA15x Series Actuator with Master/Slave mode operation selected.

Figure 8. Special Shaft Adapter.

ASK74.1U: Shaft adapter will attach to a 1.05-inch (26.6 mm) diameter shaft; the standard self-centering adapter will accept up to a one-inch (25.4 mm) diameter shaft.

- Adapter can be used for coupling to slightly oversized one-inch (25.4 mm) jackshafts.
- Shaft adapter is 13/16-inches (20 mm) shorter than the height of the self-centering shaft adapter.

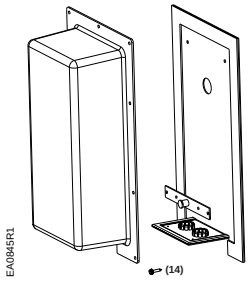


Figure 9. Weather Shield.

ASK75.1U: GCA actuators are UL listed to meet NEMA 3R requirements (a degree of protection against rain, sleet, and damage from external ice formation) when installed with ASK75.1U Weather Shield and outdoor-rated conduit fittings in the vertical position.

For dimensions, see Figure 28.

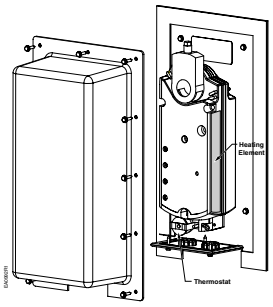


Figure 10. Heater/Weather Shield Assembly.

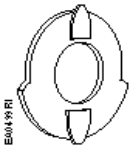
985-106: Provides protection for GIB, GBB and GCA OpenAir actuators down to temperatures of -58°F (-50°C). Assembly includes:

- Weather Shield
- Heater Kit

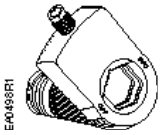
Figure 11. 499 Ohm Resistor Assembly Kit.

985-124: Used for converting a 4 to 20 mA controller output signal into a 2 to 10 Vdc actuator signal.

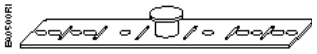
Service Parts



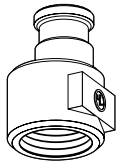
985-003
Position Indicators (10/pkg.)



985-004
Standard Shaft Adapter.



985-006
Anti-rotation (Mounting) Bracket.



985-008
Conduit Adapter, 1/2-inch (12 mm) for 1/2-inch NPT Connector.

Figure 12. Orderable Service Parts.

Operation

GCA12x and GCA22x: 2-Position Control

When power is applied, the actuator coupling moves toward the open position 90°.

GCA13x: Floating Control

A floating control signal controls the damper actuator. The actuator's angle of rotation is proportional to the length of time the signal is applied. A 24 Vac/dc control signal to Y1 causes the actuator coupling to rotate clockwise. A 24 Vac/dc control signal to Y2 causes the actuator coupling to rotate counterclockwise.

With no control voltage, the damper actuator holds its position.

GCA16x and GCA15x: Modulating Control

A continuous 0 to 10 Vdc or 2 to 10 Vdc signal from a controller to wire Y operates the damper actuator. The angle of rotation is proportional (or inverse proportional) to the control signal. A 0 to 10 Vdc, or 2 to 10 Vdc position feedback output signal is available between wires U and G0 (system neutral) to monitor the position of the damper actuator.

In the event of a power failure or when the operating voltage is shut off, all actuator models will return to the 0 position.

In the event of a blockage in a damper, actuators are overload protected over the full range to prevent damage to the actuators.

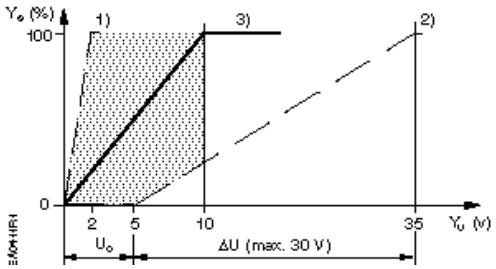
Life expectancy

An improperly tuned loop will cause excessive repositioning that will shorten the life of the actuator.

Control Signal Adjustment

GCA 163 and GCA164

The offset (start point) and span of the control signal can be adjusted. The offset, Uo, can be adjusted between 0 to 5 Vdc. The span, ΔU, can be adjusted between 2 to 30 Vdc.

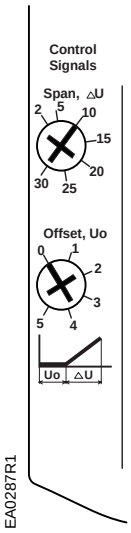


Ys Mechanical positioning range (100% = angle of rotation 90°)
Yu Control signal
Uo Offset (start point)
ΔU Span
Uo = 0V, ΔU = 2V

The minimum working range for Ys = 100%

1. Uo = 5V, ΔU = 30V The maximum working range for Ys = 100%

2. Uo = 0V, ΔU ≈ 10V Factory setting



Setting for 10V span 0V offset

Figure 13. The Minimum and Maximum Control Signal Adjustment.

Example:

Open the actuator from 0% to 50% (45°) using a control signal of Umin = 2V to Umax = 10V.

Calculating the value of ΔU:

$$\Delta U = \frac{100\,[\,\%]\,(U\,\max - U\,\min)}{\text{Working angle of rotation in }\%} = \frac{100 \text{ x } (10-2)}{50} = 16\text{V}$$

Settings

Uo = 2Y; ΔU = 16V

Umin = minimum control signal
Umax = maximum control signal

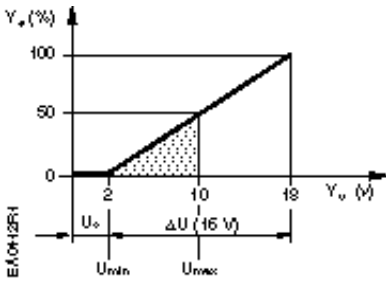
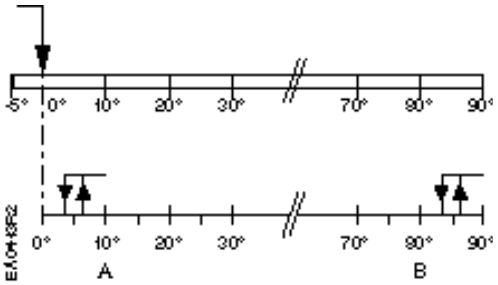


Figure 14. Example.

Dual Auxiliary Switch

GCAxx4, GCAxx6



Actuator rotary range with the shaft adapter mounted at position "0".

Setting range for switches A and B

Setting interval: 5°

Switching hysteresis: 2°

To change the settings of A and B:

1. Make sure the actuator is in the "0", fail-safe position. The scale is valid only in the "0" position.

2. Use a flat-blade screwdriver to turn the switch adjustment dials to the desired setting at which a signal is to be given.

Factory setting:

Switch A	5°
Switch B	85°

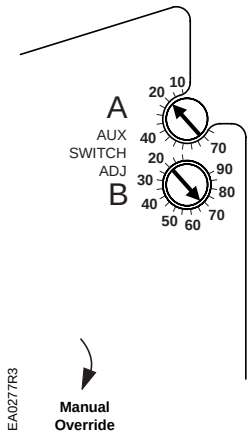


Figure 15. Dual Auxiliary Switch Dials.

NOTE: For GCA15x actuators with signal inversion switch set to Inverse Acting, 90° corresponds to either a 0 to 10 Vdc or a 2 to 10 Vdc. Vdc input signal depends on the input signal selection.

Sizing

The type of actuator required depends on several factors.

1. Obtain damper torque ratings (ft-lb/ft^2 or Nm/m^2) from the damper manufacturer.
2. Determine the area of the damper.
3. Calculate the total torque required to move the damper:

$$\text{Total Torque} = \frac{\text{Torque Rating} \times \text{Damper Area}}{SF^{1}}$$

[1] Safety Factor: When calculating the total torque required, a safety factor should be included for unaccountable variables such as slight misalignments, aging of the damper, etc. A suggested safety factor is 0.80.

4. Select the actuator type using Table 2.

NOTE: Mechanically coupled actuators must all be of the exact same type except for the dual auxiliary switches and feedback potentiometer options. Make sure to use the correct tandem-mounting bracket. See Table 2.

Table 2.

Sizing	
Total Torque	**Actuator**
<62 lb-in (7 Nm)	GMA
>62 lb-in <160 lb-in (>7 Nm <18 Nm)	GCA
>160 lb-in <320 lb-in (>18 Nm <36 Nm)	**ASK73.2U***: Tandem mounting bracket with any combination of two GCA16x (standard 0 to 10 Vdc modulating control) actuators mounted on the same side of the damper shaft. **ASK73.1*:** Tandem mounting bracket for two GCA 2-position and floating control actuators that are mounted on the same side of the damper shaft. **NOTE:** For applications requiring single damper shaft operation by up to four GCA modulating control signal actuators mounted on each side of the damper shaft, use the GCA15x Series Actuator with Master/Slave mode operation selected. See Figure 21 for master/slave DIP switch settings, and Figure 26 for wiring of this configuration.

*Tandem application tested for up to four actuators. Each bracket mounts two actuators.

Mounting and Installation

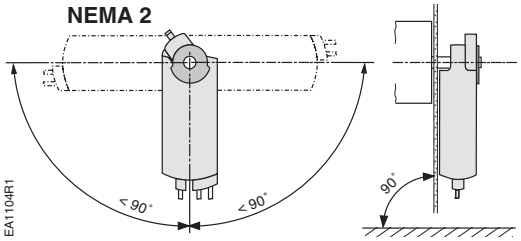


Figure 16.
Acceptable NEMA 2, IP54 per EN 60 529 Mounting Positions.

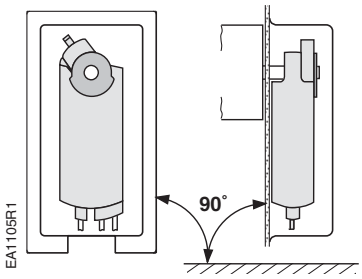


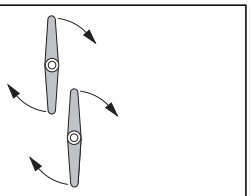
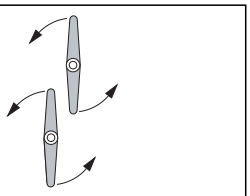
Figure 17.
Only Acceptable Mounting Position for NEMA Type 3R Rating Using ASK75.1U Weather Shield.

The GCA actuator is UL listed to meet NEMA Type 3R requirements (a degree of protection against rain, sleet, and damage from external ice formation) when installed with the Weather Shield (product number ASK75.1U) and outdoor-rated conduit fittings. Actuator must be in the vertical position.

- The shaft adapter and the position indicator can be mounted on either side of the actuator. The actuator mounting orientation and shaft length determine how they will be mounted on the actuator.
- The minimum damper drive shaft length is 3/4-inch (20 mm).
- See *Specifications* for the minimum and maximum damper shaft dimensions.
- The actuator is shipped from the factory with a 5° preload enabling tight close off of the damper in power-fail-close applications.
- A mounting bracket is included with the actuator.
- The shaft adapter and mounting parts are shipped in a separate container with the actuator.
- See the detailed mounting instructions included with each actuator.

Flip the actuator to select either clockwise or counterclockwise fail-safe rotation of the damper shaft. Follow steps 1, 2, and 3 of Table 3 to determine the correct actuator mounting orientation.

Table 3. Actuator Mounting Orientation and Damper Control.

Determining the Actuator Mounting Orientation						
		① Damper Type				
		② Power Fail Spring Return Position	Close	Open	Close	Open
		③ Actuator Mounting Orientation				
EA1037R2						
Modulating Control	**GCA15x** Using 2 to 10	Y = 10V ↺	Open	Close	Open	Close
		Y = 2V ↻				
	GCA15x or GCA16x Using 0 to 10	Y = 10V (or Y = Uo + ΔU)				
	GCA15x Using 2 to 10	Y = 2V ↺	Close	Open	Close	Open
		Y = 10V ↻				
	GCA15x or GCA16x Using 0 to 10	Y = 0V (or Y = Uo)				
EA1040R2						
3-Position	**GCA13x**	Y1 / Y2	Open	Close	Open	Close
		Y1 / Y2	Close	Open	Close	Open
EA1039R1						
2-Position	**GCA12x** **GCA22x**	Power On	Open	Close	Open	Close
EA1038R1						

Manual override

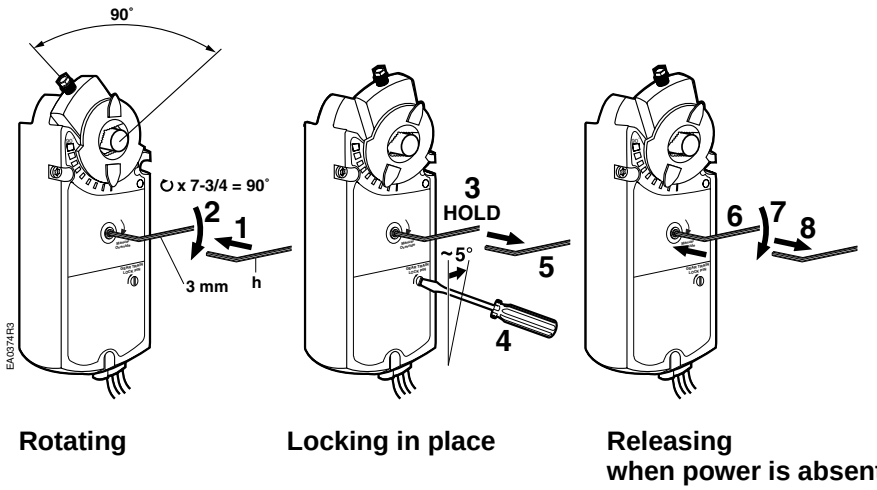


Figure 18. Manual Override.

Always turn the key in the direction of the arrow.

CAUTION:

When engaging the gear train lock pin, be careful to turn only about five degrees until you hear a click or meet slight resistance. Turning too far will strip the lock pin.

To release manual override, either restore power and send a control signal; or when power is absent, insert the 3 mm hex key in the override opening, turn the key in the direction of the arrow and remove the key.

Mechanical Range Adjustment

The angular rotation is adjustable between 0 and 90° at five-degree intervals. To limit the range of shaft movement, remove the locking clip and self-adjusting shaft adapter. Rotate the damper blade shaft to its failed position. Rotate the shaft coupling to the desired position. Insert the shaft adapter into the actuator and fasten it with the locking clip. See Figure 19.

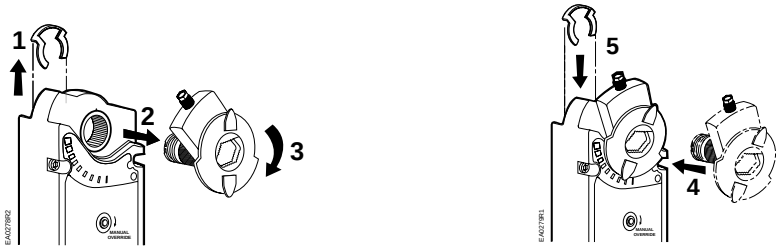


Figure 19. Mechanical Range Adjustment.

Wiring

All wiring must conform to NEC and local codes and regulations.

Use earth ground isolating step-down Class 2 transformers. Do not use autotransformers.

The maximum rating for a Class 2 step-down transformer is 100 VA. Determine the supply transformer rating by summing the VA ratings of all actuators and other components used. It is recommended that one transformer does not power more than nine actuators (or 80% of its VA).

WARNING:

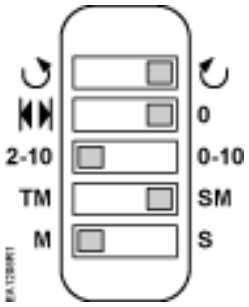
Mixed switch operation is not permitted to the switching outputs of both auxiliary switches (A and B).

Either AC line voltage from the same phase must be applied to all six outputs of the dual auxiliary switches, or UL-Class 2 voltage must be applied to all six outputs.

NOTE: With plenum cables, only UL-Class 2 voltage is permitted.

Implementation of DIP Switch Features (GCA15x Only)

Counterclockwise
Self-adapt feature
2 to 10 Vdc
Tandem Mount
Master



Clockwise
Self-Adapt Off
0 to 10 Vdc
Single Mount
Slave

Figure 20. GCA15x Series.

Self-Adapt Feature

The factory setting is 0 (OFF).

When mechanical angle of rotation is limited, the self-adapt switch may be turned ON |◀▶| so that the limited range will become the new 0 to 100% for the actuator logic. In this case, 0 to 100% is not equal to 90°

CAUTION:

When turning the self-adaptive feature on or after a software reset with the feature on, the actuator will enter a three-minute calibration cycle as the actuator adjusts to the rotation limits of the system. A software reset happens after power on or may be caused by electrostatic discharge (ESD) at levels of 2kV and above.

The position output signal U is not influenced by the self-adapt function. The 0 to 10V feedback signal U is always proportional to 0° to 90° (or 90° to 0°).

GCA15x.1x (0 to 10 Vdc or 2 to 10 Vdc) for Tandem Application (Master/Slave)

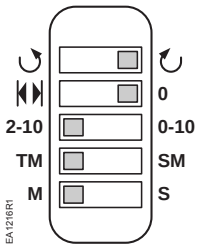


Figure 21. Tandem Application DIP Switch Settings.

- After setting the 4th DIP switch for TM (tandem mount) on all actuators used in the tandem application, one actuator must be identified as the Master by selecting the "M" on the 5th DIP switch.
- The rest of the actuators used in the application must have the "S" (slave) set on the 5th DIP switch.
- Connect all the 2 (black) Neutral wires and connect them to the power supply.
- Connect all the 1 (red) Supply wires together and connect them to the power supply.
- The Output Signal 9 (pink) wire, identified as the Master actuator, needs to be connected to all the Control Signal Wires 8 (gray) of the slave actuators used in the tandem application.

Wire Designations

Each wire has the standard symbol printed on it. See Table 4.

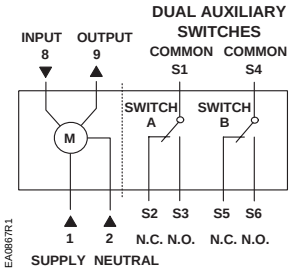


Figure 22. GCA15x, GCA16x, Modulating Control.

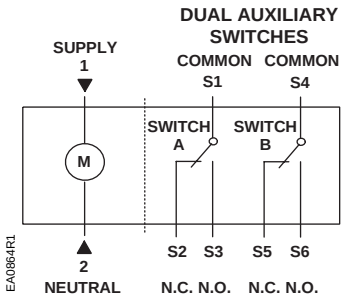


Figure 23. GCA12x, 2-Position Control.

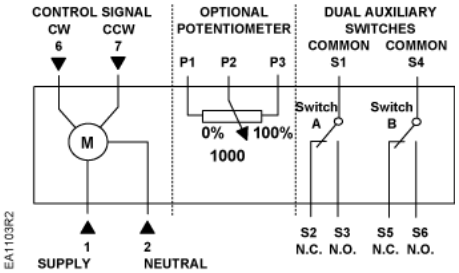


Figure 24. GCA13x, Floating Control.

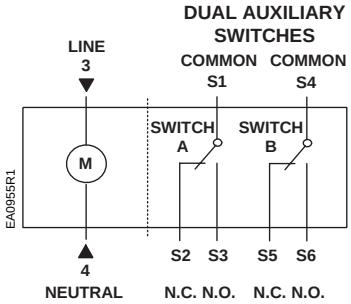


Figure 25. GCA22x, 2-Position Control.

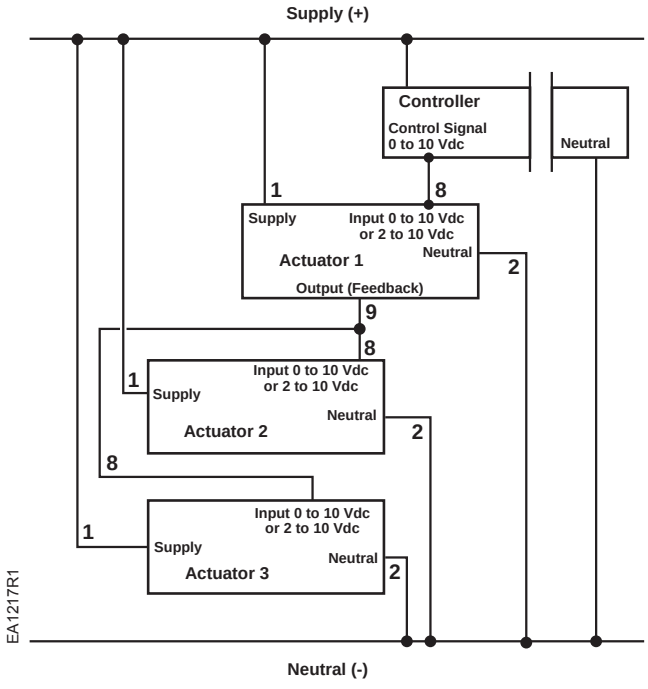


Figure 26. GCA15x.1x for Tandem Application (Master/Slave).

Table 4. Wire Designations.

Standard Symbol	Function	Terminal Designations	Color	
			Standard	Plenum
1	Supply (SP)	G	Red	Red
2	Neutral (SN)	G0	Black	Black
3	Line (120 Vac)	L	Black	Black
4	Neutral (120 Vac)	N	White	White
6	Control Signal clockwise (GCA13x)	Y1	Violet	Violet
7	Control Signal counterclockwise (GCA13x)	Y2	Orange	Orange
8	Input signal: 0 to 10 Vdc (GCA16x) or 2 to 10 Vdc (GCA15x)	Y	Gray	Gray
9	Position output: 0 to 10 Vdc (GCA15x & GCA16x)	U	Pink	Pink
S1	Switch A Common	Q11	Gray/red	Gray/red
S2	Switch A NC	Q12	Gray/blue	Gray/blue
S3	Switch A NO	Q14	Gray/pink	Gray/pink
S4	Switch B Common	Q21	Black/red	Black/red
S5	Switch B NC	Q22	Black/blue	Black/blue
S6	Switch B NO	Q24	Black/pink	Black/pink
P1	Feedback Potentiometer 0 to 100% P1 – P2	A	White/red	Black
P2	Feedback Potentiometer – Common	B	White/blue	Black
P3	Feedback Potentiometer 100 to 0% P3 – P2	C	White/pink	Black

Start-Up/ Commissioning GCA12x (24 Vac/dc) GCA22x (120 Vac)

1. Check Operation:
   a. Switch on Vac/dc power.
   b. Allow the actuator shaft coupling to rotate from 0 to 90°.
   c. Switch off Vac/dc power.
   The actuator shaft coupling will return to the "0" position.
2. Check Spring Return:
   a. Switch on Vac power.
   b. Allow the actuator shaft coupling to rotate halfway.
   c. Switch off Vac power.
   The spring returns the actuator shaft coupling to the fail "0" position.
3. Check the Auxiliary Switch A:
   a. Set the DMM dial to ohms (resistance) or continuity check.
   b. Connect wires S1 and S3 to the DMM.
   The DMM should indicate an open circuit or no resistance.
   c. Switch on Vac power.
   The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of switch A.
   d. Connect wires S1 and S2 to the DMM.
   The DMM should indicate open circuit or no resistance.
   e. Switch off Vac power.
   The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of switch A.

Start-Up/ Commissioning GCA12x (24 Vac/dc) GCA22x (120 Vac)

(Continued)

4. Check the Auxiliary Switch B:
   a. Set the DMM dial to ohms (resistance) or continuity check.
   b. Connect wires S4 and S6 to the DMM.
      The DMM should indicate open circuit or no resistance.
   c. Switch on Vac power.
      The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of switch B.
   d. Connect wires S4 and S5 to the DMM.
      The DMM should indicate open circuit or no resistance.
   e. Switch off Vac power.
      The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of switch B.

GCA13x

1. Check Operation:
   a. Connect wires 1 (red) and 2 (black) to 24 Vdc power supply.
   b. Apply a control signal (24 Vac/dc) to wire 6 (violet).
   c. Allow the actuator shaft coupling to rotate from 0 to 90°.
   d. Stop applying a control signal to wire 6 (violet).
   e. Apply a control signal (24 Vac/dc) to wire 7 (orange).
   f. Allow the actuator shaft coupling to rotate from 90 to 0°.

2. Check Spring Return:
   a. Apply a control signal (24 Vac/dc) to wire 6 (violet).
   b. Allow the actuator shaft coupling to rotate half way.
   c. Disconnect wire 1 (red).
   d. The spring returns the actuator shaft coupling to the fail "0" position.
   e. Connect wire 1 (red). The actuator shaft coupling begins to move.

3. Check Feedback:
   a. Set the digital multimeter (DMM) dial to ohms.
   b. Connect wires P1 and P2 to the DMM. The DMM should indicate a resistive value.
   c. Apply a control signal (24 Vac/dc) to wire 6 (violet).
      The reading of the DMM should increase.
   d. Stop applying a control signal to wire 6 (violet).
   e. Connect wires P2 and P3 to the DMM. The DMM should indicate a resistive value.
   f. Apply a control signal (24 Vac/dc) to wire 7 (orange).
      The reading of the DMM should increase.

4. Check the Auxiliary Switch A:
   a. Set the DMM dial to ohms (resistance) or continuity check.
   b. Connect wires S1 and S3 to DMM. The DMM should indicate an open circuit or no resistance.
   c. Apply a control signal (24 Vac/dc) to wire 6 (violet).
      The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of switch A.
   d. Stop applying a control signal to wire 6 (violet).
   e. Connect wires S1 and S2 to the DMM. The DMM should indicate an open circuit or no resistance.
   f. Apply a control signal (24 Vac/dc) to wire 7 (orange).
      The DMM should indicate contact closure as the actuator actuator-shaft coupling reaches the setting of switch A.

Start-Up/ Commissioning

GCA13x (Continued)

5. Check the Auxiliary Switch B:
   a. Set the DMM dial to ohms (resistance) or continuity check.
   b. Connect wires S4 and S6 to the DMM. The DMM should indicate an open circuit or no resistance.
   c. Apply a control signal (24 Vac/dc) to wire 6 (violet).

      The DMM should indicate contact closure as the actuator actuator-shaft coupling reaches the setting of switch B.
   d. Stop applying a control signal to wire 6 (violet).
   e. Connect wires S4 and S5 to the DMM. The DMM should indicate an open circuit or no resistance.
   f. Apply a control signal (24 Vac/dc) to wire 7 (orange).

      The DMM should indicate contact closure as the actuator actuator-shaft coupling reaches the setting of switch B.

GCA15x GCA16x

1. Check Operation:
   a. Connect wires 1 (red) and 2 (black) to the 24 Vac or 24 Vdc power supply.

      NOTE: With no input signal present, the GCA15x actuator with signal inversion switch set to Inverse Acting will start driving towards 90°.
   b. Use a Digital Multimeter (DDM) and set the dial to Vdc for the actuator input signal.
   c. Connect wires 2 (black) and 8 (gray) to the DMM.
   d. Apply to input signal wire 8 (gray):
      Y = 10 Vdc or Y = Uo + ∆U (GCA16x)
      Y = 10 Vdc (GCA15x in direct-acting mode)
      Y = 2 Vdc (GCA15x in inverse-acting mode)
   e. Allow the actuator shaft coupling to rotate from 0 to 90.
   f. Apply to input signal wire 8 (gray):
      Y = 0 Vdc or Y = Uo (GCA16x)
      Y = 2 Vdc (GCA15x in direct acting mode)
      Y = 10 Vdc (GCA15x in inverse acting mode)

   The shaft coupling returns to the "0" position.
2. Check Spring Return:
   a. Set the DMM dial to Vdc.
   b. Connect wires 2 (black) and 8 (gray) to the DMM.
   c. Apply to input signal wire 8 (gray):
      Y = 5 Vdc or Y =Uo + 1/2 ∆U (GCA16x)
      Y = 6 Vdc (GCA15x)
   d. Allow the actuator shaft coupling to rotate halfway.
   e. Disconnect wire 1 (red).

   The spring returns the actuator shaft coupling to the fail "0" position.

   f. Connect wire 1 (red) and the actuator moves.
3. Check Feedback:
   a. Set the DMM dial to Vdc.
   b. Attach wires 2 (black) and 9 (pink) to the DMM.
   c. Apply the input signal as in *Step 1d,* to wire 8 (gray).

   The reading at the DMM should increase (decrease for GCA15x in inverse acting mode).

   d. Apply the input signal as in *Step 1f,* to wire 8 (gray).

   The reading at the DMM should decrease (increase for GCA15x in inverse acting mode) and the actuator shaft coupling returns to the fail "0" position.

Start-Up Commissioning

GCA15x GCA16x (Continued)

4. Check the Auxiliary Switch A:
   a. Set the DMM dial to ohms (resistance) or continuity check.
   b. Connect wires S1 and S3 to the DMM. The DMM should indicate open circuit or no resistance.
   c. Apply the input signal as in *Step 1d,* to wire 8 (gray).

   The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of switch A.
   d. Connect wires S1 and S2 to the DMM. The DMM should indicate open circuit or no resistance.
   e. Apply the input signal as in *Step 1f,* to wire 8 (gray).

   The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of switch A.
5. Check the Auxiliary Switch B:
   a. Set the DMM dial to ohms (resistance) or continuity check.
   b. Connect wires S4 and S6 to the DMM. The DMM should indicate open circuit or no resistance.
   c. Apply the input signal as in *Step 1d,* to wire 8 (gray).

   The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of switch B.
   d. Connect wires S4 and S5 to the DMM. The DMM should indicate open circuit or no resistance.
   e. Apply the input signal as in *Step 1f,* to wire 8 (gray).

   The DMM should indicate contact closure as the actuator shaft coupling reaches the setting of switch B.

Special Application

Modulating 4 to 20 mA control with GCA15x and an external 499-ohm resistor (985-124, See Accessories).

NOTE: 985-124 is provided with the GCA15x actuator.

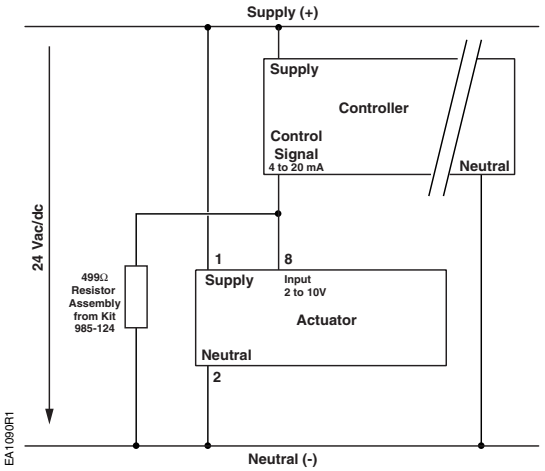


Figure 27.
Wiring Diagram for Converting 4 to 20 mA into 2 to 10 Vdc.

Service

WARNING:

Do not open the actuator. If the actuator is inoperative, replace the unit.

Troubleshooting

WARNING:
To avoid injury or loss of life, pay attention to any hazardous voltage (for example, 120 Vac) when performing checks.

- Check that wires are connected correctly.
- Check that offset (start point) and span are set correctly, if used.
- Use a Digital Multimeter (DMM) to verify that the operating voltage is within range.
- If the actuator is not working, check the damper for blockage. If blocked, remove the obstacle and cycle the actuator power off and on. The actuator should resume normal operating mode.

Dimensions

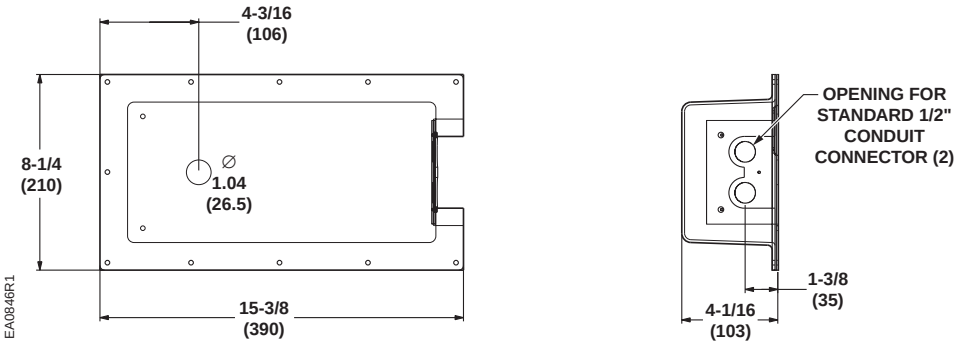


Figure 28. Dimensions of the ASK75.1U Weather Shield in Inches (Millimeters).

Dimensions, Continued

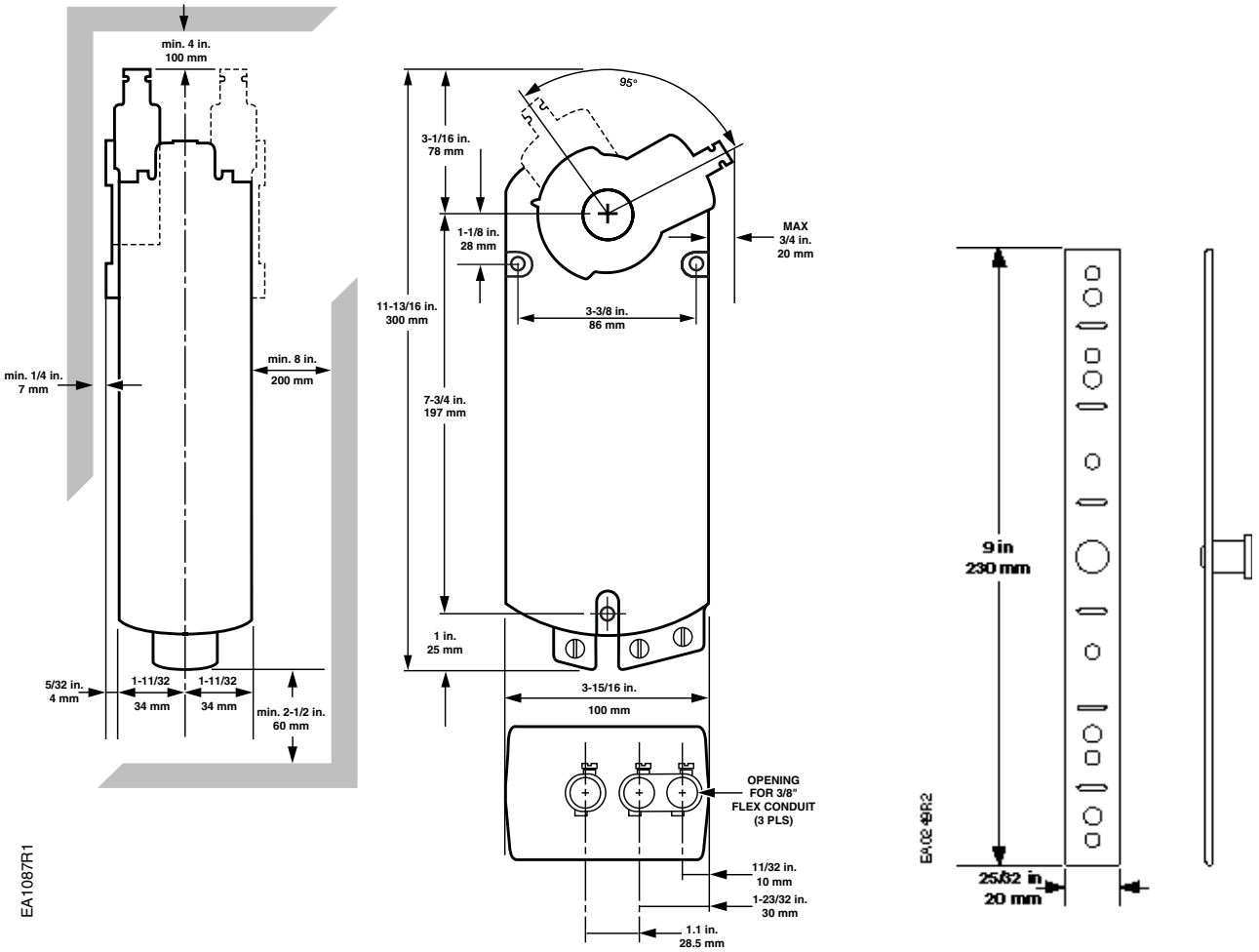


Figure 29. Dimensions of the GCA Actuator and Mounting Bracket in Inches (Millimeters).

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